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List of Acronyms

AEA	Atomic Energy Act
ADA	Analytical Cell Decontamination Area
AHA	Acid Handling Area
ANA	Analytical Aisle
ANC	Analytical Cell
ARC	Acid Recovery Cell
ARPR	Acid Recovery Pump Room
CAA	Cell Access Aisle
CCR	Chemical Crane Room
COA	Chemical Operating Aisle
CPC	Chemical Process Cell
CVA	Chemical Viewing Aisle
DOG	Dissolver Off-gas
ECR	Extraction Chemical Room
EDR	Equipment Decontamination Room
EMOA	East Mechanical Operating Aisle
FRS	Fuel Receiving and Storage
GOA	General Purpose Cell Operating Aisle
GPC	General Purpose Cell
GCR	General Purpose Cell Crane Room
HAC	Hot Acid Cell
HAPR	Hot Acid Pump Room
HEPA	High-efficiency Particulate Air (filter)
HEV	Head End Ventilation System
LLWTF	Low-level Waste Treatment Facility
LWC	Liquid Waste Cell
LWA	Lower Warm Aisle
LWTS	Liquid Waste Treatment System
LXA	Lower Extraction Aisle
MC	Miniature Cell
MCR	Mechanical Crane Room
MOA	Mechanical Operating Aisle
MRR	Manipulator Repair Room
MSM	Master-slave Manipulator
NDA	NRC-licensed Disposal Area
NPR	New Production Reactor
OGA	Off-gas Aisle
OGBR	Off-gas Blower Room
OGC	Off-gas Cell

List of Acronyms *(concluded)*

PCR	Process Chemical Room
PMC	Process Mechanical Cell
PMCR	Process Mechanical Crane Room
PPC	Product Purification Cell
PPS	Product Packing and Shipping Area
RCRA	Resource Conservation and Recovery Act
RER	Ram Equipment Room
SCVM	Solvent Cycle Valve Manifold
SRR	Scrap Removal Room
SSC	Sample Storage Cell
SST	Solvent Storage Terrace
TRU	Transuranic
UPC	Uranium Product Cell
UR	Utility Room
UWA	Upper Warm Aisle
UWAPN	Upper Warm Aisle Pump Niches
UXA	Upper Extraction Aisle
VEC	Ventilation Exhaust Cell
VOG	Vessel Off-gas
VSR	Ventilation Supply Room
VWR	Ventilation Wash Room
WMOA	West Mechanical Operating Aisle
WRPA	Waste Reduction and Packaging Area
WTF	Waste Tank Farm
XC-1	Extraction Cell 1
XC-2	Extraction Cell 2
XC-3	Extraction Cell 3
XCR	Extraction Chemical Room
XSA	Extraction Sample Aisle

DRAFT RCRA FACILITY INVESTIGATION (RFI) REPORT
SEALED ROOMS

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DRAFT RCRA FACILITY INVESTIGATION (RFI) REPORT
SEALED ROOMS

1.0 Introduction

This report presents the results of a detailed review of historical information to determine whether Resource Conservation and Recovery Act (RCRA) hazardous waste or hazardous constituents were associated with or released from eleven sealed rooms in the former Nuclear Fuels Services, Inc. (NFS) process building in West Valley, New York.

The process building is currently under the possession and control of the U.S. Department of Energy (DOE) as part of the West Valley Demonstration Project (WVDP). The purpose of the Project is to process and treat approximately 2,498,100 liters (660,000 gal) of liquid high-level radioactive waste, some of which will be vitrified and some will be solidified in cement. The DOE and the New York State Energy Research Development Agency (NYSERDA), which holds title to the approximately 80 hectares (200 acres) comprising the WVDP, are bound by a RCRA 3008(h) Administrative Order-on-Consent issued jointly by the U.S. Environmental Protection Agency (EPA) and the New York State Department of Environmental Conservation (NYSDEC). The 3008(h) Order requires that the DOE and NYSERDA perform a RCRA Facility Investigation (RFI) to determine whether RCRA-defined hazardous waste or hazardous constituents have been released to the environment from solid waste management units (SWMUs) at the WVDP.

The DOE and NYSERDA identified eleven sealed rooms in the former NFS process building as solid waste management units and reported their existence to the EPA and NYSDEC in an October 11, 1990 correspondence. The sealed rooms to be investigated as SWMUs are:

1) the Process Mechanical Cell (PMC)
2) the Ram Equipment Room (RER)
3) the General Purpose Cell (GPC)
4) the Miniature Cell (MC)
5) the Extraction Cell 1 (XC-1)
6) the Extraction Cell 2 (XC-2)
7) the Upper Warm Aisle Pump Niches (UWAPN)

8) the Hot Acid Cell (HAC)
9) the Liquid Waste Cell (LWC)
10) the Off-Gas Blower Room (OGBR)
11) the Ventilation Wash Room (VWR)

Because of high radiation levels the rooms are restricted access areas. Several of the rooms have not been entered since the process building began operations in 1966.

In addition to the sealed rooms recognized previously, additional rooms/cells in the Process Building were identified during this review which met the definition of a sealed room. Several of these rooms do not meet the definition of a sealed room but were also discussed to provide a comprehensive RCRA characterization of these rooms. The remaining rooms/cells in the plant are associated with SSWMUs 3 and 4 and will be addressed under those particular evaluations. For clarity and perspective, the rooms/cells which are associated with the sealed rooms will be discussed under the respective sealed room, while the stand-alone areas will be discussed in a separate section.

The scope of the Sealed Rooms Paper Characterization is outlined in the RFI Work Plan (West Valley Nuclear Services Co., Inc. December 16, 1993). This paper characterization is a historical review that uses existing process documentation, piping and instrument diagrams, and construction diagrams to fully assess potential pathways and determine whether hazardous waste or hazardous constituents are contained within the room.

2.0 Process Building Description

The former NFS process building is located approximately 50 kilometers (30 mi) south of Buffalo, New York near the town of West Valley (Fig. 1). The process building and its surrounding grounds occupy approximately 80 hectares (200 acres) of the 1,335-hectare (3,345-acre) Western New York Nuclear Service Center (WNYNSC). Construction of the process building began in May 1963 and was completed in mid-1965 (Nuclear Fuel Services, Inc. 1973).

The process building was designed to recover uranium and plutonium from spent nuclear fuel. Several commercial nuclear power plants and the DOE facility at Hanford, Washington supplied spent nuclear fuel assemblies for reprocessing. The assemblies arrived at NFS by rail and truck cask and were stored in fuel receiving and storage (FRS) before reprocessing (Fig. 2). Reprocessing involved a "chop-leach" method. The spent nuclear fuel assemblies were mechanically sheared and the sheared fuel was dissolved in concentrated nitric acid. The dissolved fuel was an aqueous stream containing uranium nitrate, plutonium nitrate, and fission products. A five-stage solvent extraction process using a tributyl phosphate/n-dodecane solution separated the fission products from the uranium and plutonium and then separated the uranium from the plutonium. Aqueous uranium nitrate and plutonium nitrate were the final products of the reprocessing cycle. Nuclear fuel was reprocessed from April 1966 until early 1972, when the process building was shut down for modification and expansion purposes. Decontamination activities have been conducted in a number of rooms since 1972.

The physical and chemical reprocessing operations were conducted in specially designed cells, rooms, and aisles in the process building. The cells were shielded enclosures or compartments with extremely restricted access where the fuel was physically and chemically processed. Shielding was provided by poured concrete floors, walls, and ceilings that were up to 1.68 meters (5.5 ft) in thickness and were frequently lined with stainless steel. The rooms in the process building were designed to support the reprocessing operations. These rooms were typically not shielded but were closed requiring physical entry through a door. The aisles were areas occupied by people that remotely controlled the physical and chemical reprocessing of fuel in the cells.

The process building ventilation and waste systems were designed to minimize releases of radioactivity to the environment during operations. Four ventilation systems operated in the process building: the main ventilation system, the head-end ventilation system, the vessel off-gas system, and the dissolver off-gas system. All of the systems, with the exception of the dissolver off-gas, are still in operation.

The main ventilation system is the primary ventilation system in the process building. It is designed so that air entering the ventilation supply is always distributed from areas and rooms containing lesser radioactivity to those containing equal or greater radioactivity. The air in the main ventilation system is not recirculated and flows through the plant on a once-through basis. The main ventilation system air discharges into the main plant ventilation exhaust system where it passes through one of two filter trains, each containing thirty roughing filters and thirty high-efficiency particulate air (HEPA) filters, before discharging through the plant main stack. The HEPA filters remove 99.95% of all particulates 0.3 microns (0.0003 mm) in diameter or larger.

The head end ventilation system (HEV) services the cells and operating aisles involved in the mechanical processing of nuclear fuel. Air in the head end ventilation system flowed through areas and rooms of lesser radioactivity to those of equal or greater radioactivity and discharges to the HEV building, where it passed through one of two filter trains, each containing a prefilter, roughing filter, and two stages of HEPA filters, before discharge through the plant main stack.

The vessel off-gas (VOG) system ventilates gases from process vessels and tanks to the process building off-gas cell (OGC) where the gas passes through a condenser, a scrubber, and two sets of roughing and HEPA filters before discharge to the main ventilation exhaust system. The dissolver off-gas (DOG) system ventilated gases generated from the process building dissolvers during fuel reprocessing. These gases were treated in the off-gas cell in the same manner as the gases from the VOG. The DOG system was built with a silver iodide reactor to remove radioactive iodine but it was never put into operation.

Aqueous waste streams were a by-product of the fuel reprocessing operation. Depending on the source of the waste streams in the fuel reprocessing cycle, the aqueous waste streams contained various amounts of radioactivity. The radioactivity was principally from fission products. The plant was designed with three treatment systems to collect, treat, and store or dispose of aqueous waste.

The high-level waste evaporator reduced the volume of aqueous waste generated during the partition cycle of the solvent extraction process. The partition cycle aqueous waste stream contained more than 99.5% of the total radioactivity contained in the aqueous waste streams from the five cycles of the solvent extraction process. The concentrated acidic waste was neutralized with sodium hydroxide and the neutralized waste was pumped to the high-level waste storage tank 8D-2 for storage.

The low-level and high-level waste evaporators were used to reduce the volume of aqueous waste generated in the other four solvent extraction cycles in addition to the condensate from the high-level evaporator and the rework evaporator. The concentrated acidic waste from the low-level evaporator was neutralized with sodium hydroxide and the neutralized waste was jetted to tank 8D-2 for storage.

The low-level waste treatment facility (LLWTF) has been in operation since May 24, 1971. It was designed to treat process building-generated wastewater that contained traces of various fission product radionuclides. Sources of this water included floor drains in rooms not actively involved in reprocessing, drains from the chemistry laboratories, and water from the FRS, including cask-washing water. Drain lines from the process building conveyed the wastewater, in sequence, to a pair of interceptors, lagoon 1 and lagoon 2 (prior to 1984) or lagoon 2 (after 1984), and LLWTF, where radioactivity in the waste stream was removed by clarification, filtration, and ion-exchange. The treated water was and still is collected in lagoons 4 and 5 where it is sampled and, if within release specifications, is transferred to lagoon 3 before discharge into Erdman Brook.

From April 1966 to May 24, 1971 all wastewater was sent in sequence to the interceptors, lagoon 1, lagoon 2, and lagoon 3 before release to Erdman Brook. The wastewater was not treated in the lagoons.

3.0 Cell Description

3.1 Process Mechanical Cell

The process mechanical cell (PMC) is a reinforced concrete structure located west of the fuel receiving and storage (FRS) pool at a plant elevation of 30.48 meters (100 ft), which is ground-level, and corresponds to an elevation of 1,415 feet NGVD (Fig. 3). Spent nuclear fuel was mechanically processed in the PMC as part of the first stage of the reprocessing operation. Chemicals were not used during the mechanical processing operations in the PMC. (See section 3.1.2.1 below.)

3.1.1 Cell Description and Control Features

The PMC is 3.66 meters (12 ft) wide, 15.85 meters (52 ft) long, and 7.62 meters (25 ft) high (Burn 1983). The walls and floor of the PMC are 1.68 meters (5.5 ft) thick and the ceiling is 1.83 meters (6 ft) thick. The floor is covered with 304L stainless steel, which also extends up the walls to a height of 6.3 meters (20.67 ft). The concrete walls above the stainless steel are coated with a carboline-based paint.

The PMC has six shielded viewing windows, four along the west wall and one each at the northwest and southeast corners (Fig. 4). The windows allowed operations to be viewed from the mechanical operating aisle. The windows are approximately one meter (3.28 ft) square. Each window has either four or five panes of leaded glass that are about 0.25 meters (10 in) thick. The space between the leaded glass panes is currently filled with Low Pour-150 oil (LP-150), a pharmaceutical grade white mineral oil. The windows were originally filled with R-95, a similar type of mineral oil. Oil is currently leaking out of four of the six windows, and four of the windows are covered with plywood. A material safety data sheet (MSDS) for LP-150 is provided in Appendix A.

The PMC is accessible from the following seven locations (Fig. 4):

1) a 0.9-meter (3.0-ft) thick vertical lift shield door at the north wall of the PMC that connects with the process mechanical crane room (PMCR). The shield door is still operable.

2) a 0.53-meter (21-in) diameter floor hatch in the southeast corner of the PMC that connects to the FRS. It is not known whether this hatch is open or closed.

3) a 0.56-meter (22-in) square hatch in the east wall of the PMC that connects to the east mechanical operating aisle (EMOA). The hatch is closed and still operable.

4) a ceiling hatch in the southwest corner of the PMC that connects with the analytical sample storage cell (SSC).

5) a 0.51-meter (20-in) diameter chute in the floor at the northern end of the PMC that connects with the miniature cell (MC). The chute may be currently covered.

6) a 0.9-meter x 1.2-meter (3-ft x 4-ft) floor hatch at the north end of the PMC that connects with the General Purpose Cell (GPC). The hatch is open, allowing air to flow from the PMC to the GPC.

7) a 0.2-meter (8-in) diameter shear discharge chute that connects with the GPC. The chute is currently open.

The shield door, hatches, and chutes were part of the original design of the plant and were designed to support reprocessing operations in the PMC and adjoining areas.

A screened floor drain is located in the middle of the cell at its north end and another at the south end. These drain by gravity to the general purpose cell sump via a 7.63-centimeter (3-in) diameter drain line. The drain lines are located within the concrete floor of the cell.

In addition to the hatches and floor drains there are approximately 205 additional penetrations in the floor, walls, and ceiling of the PMC. Approximately 95% of the penetrations were for 1.25- to 2.5-centimeter (0.5- to 1.0-in) diameter conduits that connected PMC equipment to plant air, water, and steam utilities. Air lines into the PMC accounted for nearly 25% of the small-diameter piping, while penetrations for electrical service account for another 25% of the penetrations. The largest penetrations housed large equipment such as the pushout rams, shear cylinder, and the ratchet drive.

The PMC, which is serviced by the head end ventilation system, receives its airflow from the mechanical crane room (MCR), the west mechanical operating aisle (WMOA), and the east mechanical operating aisle (EMOA). Air discharges from the PMC into the GPC through the 0.9-meter x 1.2-meter (3-ft x 4-ft) floor hatch connecting the PMC and GPC at the north end of the PMC at a flow rate of approximately 2,000 ft^3/min (cfm). A smaller volume of air discharges to the GPC through the 0.2-meter (8-in) diameter shear discharge chute.

3.1.2 Historical Operations and Decontamination Activities

3.1.2.1 Historical Operations

Spent nuclear fuel was mechanically processed in the PMC during the initial stage of the reprocessing operation. Chemicals were not used during the mechanical reprocessing of the fuel other than those used to put out any possible fires.

The principal equipment in the PMC during reprocessing were two 2-ton bridge-mounted fuel handling cranes, a bridge-mounted power manipulator, four master/slave manipulators (MSMs), a fuel cut-off saw, and a 250-ton hydraulic fuel bundle shear. All equipment was operated remotely from the mechanical operating aisle. The original equipment that was present in the PMC is listed in Table 1.

The two 2-ton capacity bridge cranes traveled the length of the cell along a set of rails 6.4 meters (21 ft) above the floor and were used to transport fuel assemblies to the various work stations in the PMC.

A fuel canister containing a fuel assembly would be transferred from the FRS by an underwater swing arm transfer conveyor to the FRS floor hatch in the southeast corner of the PMC. One of the bridge cranes would lift the fuel assembly from the canister through the hatch, allow the assembly to drain, and then transfer the assembly to the disassembly inspection table for visual inspection and marking for sawing.

The bridge crane would then transfer the fuel assembly to the saw table where the end fittings, if present, were cut off with the fuel cut-off saw. The saw used an abrasive disc blade and the cutting was generally done dry, although water was used on a number of occasions.

The master/slave manipulators (MSMs), which were installed at the viewing windows in the west mechanical operating aisle, were remotely controlled devices used to pick up the removed end fittings and place them in a scrap drum. The MSMs were also used for maintenance and inspection operations during the mechanical processing of fuel. The filled scrap drums were transferred to the general purpose cell (GPC) and then to the scrap removal room (SRR) where they were placed in a shielded scrap cask. A shielded truck transported the scrap cask to the NRC-licensed disposal area (NDA) for burial (Fig. 2).

If the fuel assembly had an outer casing the assembly was pushed out of the casing with the saw table pushout ram that was housed in the adjoining ram equipment room (RER). The casing was then returned to the FRS where it was placed in a shielded cask and taken to the NDA for disposal.

The fuel assembly (bundle) with its intact cladding was transported with a fuel carrier attached to one of the two bridge cranes and placed into the fuel bundle shear feed magazine. The shear feed drive mechanism fed the assembly into the fuel bundle shear, which cut the fuel assembly into predetermined lengths of either 1.6 centimeters (0.625 in), 2.5 centimeters (1 in), 3.8 centimeters (1.5 in), or 5 centimeters (2 in). The shearing was done dry and did not involve any fluids.

The chopped fuel dropped through the 0.20-meter (8-in) diameter shear discharge chute into a steel-lined fuel basket in the underlying general purpose cell. The shear's main hydraulic unit and cylinder were located in the east mechanical operating aisle. The cut-off saw, bundle shear, and associated equipment were removed from service and partially dismantled in 1972 (Riethmiller 1981).

During shearing, the shear, the feed tube, shear chamber, and discharge chute were vented to the dissolver off-gas system and the shear was purged with either nitrogen or argon to prevent the fuel cladding, composed of Zircaloy, from igniting. The Zircaloy cladding was pyrophoric and self-ignited on several occasions during operations in 1967 (Lewis 1968).

The nuclear fuel that was reprocessed was in the form of uranium oxide (UO_2), uranium metal, or an alloy of uranium with either molybdenum (Mo), zirconium (Zr), or aluminum (Al) (E.R. Johnson Associates, Inc. 1980). The fuel was enclosed in a metal cladding composed of stainless steel, Zircaloy, or aluminum. Inconel and Incoloy was also used in some of the fuel hardware (Jenquin et al. 1992). Zircaloy is a zirconium alloy composed principally of zirconium (98.5%) with minor amounts of tin (1.4%), iron (0.1%), Cr (0.1%), Ni (0.05%), and O (0.12%) (American Society of Materials International 1990). Inconel and Incoloy are nickel-chromium-iron alloys in the following weight percents: nickel (50-70%), chromium (14-21%), iron (5-30%) (American Society of Materials International 1990).

The PMC was equipped with both a gas and dry powder fire suppression system. The gas system used pressurized CO_2 in bottles stored in the operating aisle. The CO_2 would be piped into the PMC to extinguish fires. The Met-L-X and CO_2 fire suppression system, which is presently inoperative, used a pressurized powder composed principally of sodium chloride (NaCl) to extinguish metal fires in the PMC.

The PMC is not currently being used and there are no plans for its future use because of the high radiation levels in the cell. (Radiation levels in the PMC are discussed in section 3.1.3 below.)

3.1.2.2 Decontamination and Decommissioning Activities

In 1972 the West Valley nuclear fuel reprocessing plant was to be modified and expanded to increase production and operational reliability. The planned modifications and expansion required extensive decontamination of vessels, piping, and areas of the plant. The decontamination efforts from 1971 to 1981 are chronicled in Riethmiller's History of Decontamination (1981).

A general cleanup of the PMC was conducted between October 22, 1971 and September 15, 1972. The cleanup involved removal of accumulated waste to the scrap removal room and dismantling of equipment designated for replacement or termination. The PMC was not flushed with decontamination solutions during the cleanup.

Some of the equipment removed included the shear ram, knife, rack and pinion, feed magazine, feed magazine rack, all new production reactor (NPR) handling equipment, and several pushout ram supports. The equipment was either transferred to the FRS via the underwater transfer or to the scrap removal room via the GPC and placed into containers for disposal. Large equipment such as the Tysaman saw, the fuel bundle shear feed magazine, feed rack housing, and two hatch plugs were removed through the roof hatches of the process mechanical crane room (PMCR) with a crane used in waste burial operations (Riethmiller 1981).

Scoops were used to pick up small waste items in relatively inaccessible locations. Among these were sample bottles from the analytical cells that had spilled to the floor near the ceiling hatch in the southwest corner of the PMC (Riethmiller 1981). (During reprocessing the sample bottles were transported from the analytical cells through the PMC to scrap removal and finally to waste burial.) The contents, type, and condition of the sample bottles are unknown.

3.1.3 Current Conditions

Low Pour-150 oil (LP-150), a pharmaceutical grade white mineral oil, is currently leaking from four of the six shielded viewing windows in the PMC. However, LP-150 does not contain any RCRA hazardous constituents.

There have been no manned entries into the PMC since 1966, so a detailed assessment of the condition of the cell is unavailable. A remote in-cell visual inspection, radiation survey, and sampling of the PMC was performed in early 1986 (Vance 1986).

The visual inspection was performed with an auto-focusing color television camera equipped with an adjustable wide-angle and telephoto lenses. The camera was inserted into the PMC through the 25-centimeter (10-in) diameter master/slave manipulator ports and suspended from a bridge crane, which transported the camera through the cell.

Standing liquid was not observed in the PMC. The entire floor was covered with saw fines and small metal objects, including portions of the outer casing of an NPR and a Yankee reactor fuel assembly. The following process equipment was observed in the cell (Vance 1986):

- fuel element shear without ram, knife, gauges, or magazine
- maintenance table
- disassembly inspection and pushout table
- ram pulling feature
- an operable cut-off saw that requires a new blade
- pump and motor from the Tysaman saw that was replaced by the cut-off saw
- tilt fixture bracket without the tilt fixture

The radiation survey used both mid-range (0.1 R/hr to 200 R/hr) and high-range (10 R/hr to 20,000 R/hr) beta-gamma ion-chamber radiation probes. The probes were inserted into the PMC through the 25-centimeter (10-in) diameter master/slave manipulator ports, suspended from the bridge crane, and moved throughout the cell. A gross intensity and a collimated radiation survey was performed in the PMC.

The gross intensity survey, which used an unshielded high-range probe suspended 1.8 meters (6 ft) above the cell floor, measured gross beta-gamma intensities in a thirty-nine-sector survey grid in the cell (Fig. 5). At 1.8 meters (6 ft) above the cell floor gross beta-gamma radiation intensity ranged from 40 R/hr to 270 R/hr. The highest intensity was measured near the fuel cut-off saw in the center of the cell and at the fuel bundle shear in the northeast corner of the PMC.

The collimated survey used both medium- and high-range probes mounted in a collimating fixture with beta shielding over the probes. This survey measured the gamma radiation intensity in the same thirty-nine sector survey grid used in the gross radiation intensity survey. At 1.8 meters (6 ft) above the floor of the cell (Fig. 6) collimated gamma radiation intensities ranged from 0.8 R/hr to 40 R/hr. The highest gamma intensity was measured in the center of the cell near the fuel cut-off saw and near the fuel bundle shear in the northeast corner of the PMC.

Twelve samples of loose solids in the PMC were collected from May 12 to May 13, 1986 (Fig.7). The samples were collected in individual sample cartridges with a vacuum sampling device suspended from a crane hook. The samples were transferred to the analytical cells where they were analyzed for radioactive constituents (Table 2).

The fission product cesium-137 was the principal source of radiation in the cell. Cobalt-60, a neutron activation product, and transuranic radionuclides such as Pu-238 and Pu-239/240 also contributed to the activity in the cell.

3.1.4 Conclusions: Potential for Release

Chemicals were not used during the mechanical processing of the fuel assemblies in the PMC, nor were they used for any of the decommissioning or decontamination activities that were carried out in the cell. However, chemicals may have been present originally in the sample bottles that were observed on the floor, but by now may have evaporated away. The contents of these bottles are not known. Liquids were sampled at various stages during the chemical reprocessing of the spent nuclear fuel and were analyzed for uranium and plutonium content in the hot analytical cells. The samples were usually aqueous and may have contained fission products, HNO_3, uranium, plutonium, and possibly small concentrations of dissolved tributyl phosphate and n-dodecane.

The 1986 visual inspection indicated that the floor was covered with saw fines and small metal objects. The saw fines originated during the removal of the end fittings from the fuel assemblies and during the shearing of the fuel assemblies. The saw fines are most likely a mixture of fission products and minor amounts of uranium and plutonium from the fuel, and stainless steel, Zircaloy, aluminum, Inconel, and Incoloy from the cladding. The Zircaloy cladding was known to be pyrophoric during operations. At present, the potential for spontaneous combustion of this material is considered unlikely since an oxide layer has probably formed on the Zircaloy, negating its pyrophoric property (Vance 1986).

Low Pour-150 oil (LP-150), a pharmaceutical grade white mineral oil, is currently leaking from four of the six shielded viewing windows in the PMC. However, a review of LP-150 composition indicates it does not contain any RCRA hazardous constituents nor is it considered a RCRA-listed waste.

Based upon this review there are no indications that RCRA hazardous waste or hazardous constituents were managed in the PMC. The fuel cladding and saw fines would not be regulated under RCRA pursuant to the Atomic Energy Act (AEA) by-product exclusion. There are no known releases of any materials to the environment from the PMC. Releases to the underlying sand and gravel unit are considered unlikely since the cell is lined with welded stainless steel and the concrete floor is 1.68 meters (5.5 ft) thick. Any liquid chemicals in the sample bottles would have evaporated and discharged through the head end ventilation system. Any solids that may have become airborne would have migrated from the PMC to the HEV building where the four-stage filter train would have removed at least 99.95% of particulates 0.3 micron (0.0003 mm) in diameter or larger. No further action is proposed for the process mechanical cell.

3.1.5 Associated Rooms

3.1.5.1 Manipulator Repair Room

The manipulator repair room (MRR) is located north of the mechanical operating aisle and underneath the process mechanical cell crane room at a plant elevation of 30.48 meters (100 ft) (Fig. 3). The manipulator repair room (MRR) measures 3.05 meters (10 ft) on a side (Burn 1983). The walls are 0.30 meter (1 ft) thick filled concrete block and the floor and ceiling are 0.60 meter (2 ft) thick concrete. A small lead glass shield window (0.25 ft x 1.0 ft) allows operations in the MRR to be viewed from the mechanical operating aisle.

The MRR may be accessed through the following locations:

- an airlock that connects with the mechanical operating aisle
- a (4 ft x 4 ft) hatch in the ceiling of the MRR that connects to the overlying mechanical crane room

The MRR was used to repair and adjust the process mechanical cell bridge-mounted power manipulator. When repairs were required, the power manipulator was transferred along its rail to the mechanical crane room that overlies the MRR. The power manipulator would be positioned above and extended through the ceiling hatch connecting the MRR and the crane room so the manipulators hand, wrist, and arm could be repaired without workers being exposed to the radiation field in the MCR or the manipulators bridge.

When necessary, the manipulator would normally be decontaminated with a hydrobrush and water. On occasion, Radiacwash® or Turco® decontamination solutions may have been used. Wash solutions would have flowed to the cell floor drain that connected to tank 35104 in the general purpose cell crane room extension. Tank 35104 would be emptied by eductor to the low-level waste evaporator feed tank (7D-2) in the liquid waste cell. The MRR is no longer used to support operations.

The MRR was decontaminated between October 22, 1971 and July 10, 1972 (Riethmiller 1981). Ladders, debris, and other items were removed from the MRR. The floor and walls were scrubbed with Chem-Clean® and water, paint was removed, and some surface grinding performed. The volume of Chem-Clean® used is unknown.

Although Turco® decontamination solutions may contain hazardous constituents, none is believed to have remained in the MRR after it was decontaminated in 1972. If hazardous constituents were used, none is believed to have remained in tank 35104 which was used and flushed repeatedly since reprocessing operations ended. Since there have been no known releases of any material from the MRR to the environment, no further action is proposed for the cell at this time.

3.2 Ram Equipment Room

The ram equipment room (RER) is located south of and adjacent to the PMC at a plant elevation of 30.48 meters (100 ft) (See Fig. 3). The ram equipment room contained the saw table pushout ram and the disassembly inspection pushout (DIPO) ram and their associated hydraulic pump system (Burn 1983). The RER is currently used to store thirty 208-liter (55-gal) radioactive waste drums.

3.2.1 Cell Description and Control Features

The RER is 8.5 meters (27.89 ft) long, 3.6 meters (11.81 ft) wide, and 4.11 meters (13.5 ft) high. The walls, floor, and ceiling are carboline-coated concrete.

The RER may be entered from the east mechanical operating aisle through a door located in the southeast corner of the RER. A floor drain in the RER is connected to the plant interceptor system (Riethmiller 1981).

The RER is ventilated by the main ventilation distribution system and receives approximately 650 cfm of airflow from the east mechanical operating aisle and 650 cfm from the cell access aisle. During reprocessing, air from the RER was discharged at a rate of 1,350 cfm to the ventilation wash room (VWR) washer, which is now out-of-service. Currently, air from the RER bypasses the washer and goes to the main ventilation exhaust plenum, where it passes through thirty roughing and HEPA filters before discharge through the main stack.

3.2.2 Historical Operations and Decontamination Activities

3.2.2.1 Historical Operations

The RER contained the saw table pushout ram and the disassembly table pushout ram and their associated hydraulic pump system. Chemicals were not used in the RER during reprocessing and the RER did not contain any type of storage vessels. The pushout rams were removed from the RER during decommissioning and decontamination activities in the early 1980s.

Thirty drums are currently stored in the RER. Twenty-four of the drums contain TRU waste; the other six drums contain special nuclear material, principally plutonium nitrate [$Pu(NO_3)_4$].

Of the twenty-four drums containing TRU waste:

- Twelve (12) of the drums contain vacuum pails or canisters derived from the decontamination of the lower warm aisle pump niches.

- Four (4) of the drums contain solids from solvent storage terrace (SST) tank 13D-7. The solids are contained in a lead-lined 5-gallon pail in the TRU waste drums.

- Three (3) of the drums each contain two cans of liquid from the alpha lab.

- Two (2) of the drums each contain a 30-gallon drum that contains five bottles of material removed from the extraction sample aisle.

- Two (2) of the drums contain debris from the glove box of product sample cell No. 1.

- One (1) drum contains 5 gallons of uranyl nitrate hexahydrite from the uranium loadout piping.

The twenty-four TRU waste drums have been scheduled for transfer to the on-site LAG facilities for storage.

The $Pu(NO_3)_4$ was recovered during the decommissioning and decontamination work that was performed in the hot analytical cells and the extraction sample aisle (XSA) (Allen 1986b). The chemical composition and isotopic distribution of the recovered material is summarized in Table 3.

The concentrated fissile solutions in the laboratory bottles and beakers were placed in 18.9-liter (5-gal) metal pails filled with absorbent, which were overpacked into 113-liter (30-gal) yellow drums. The 30-gallon drums were then placed into four 208-liter (55-gal) transuranic (TRU) waste drums.

One of the glove boxes in the extraction sample aisle was found to contain approximately 0.0283 m^3 (1 ft^3) of crystalline material that was estimated to contain 350 grams of fissile material (Allen 1986b). The crystalline material was placed in six 1-liter polyethylene bottles. The bottles were overpacked in two 18.9-liter (5-gal) metal pails, with three bottles in one pail and two bottles in the other. The two 18.9-liter pails were then overpacked in two 208-liter (55-gal) TRU waste drums, one pail to a drum.

3.2.2.2 Decontamination and Decommissioning Activities

Decontamination of the RER began on March 3, 1972 (Riethmiller 1981). PMC equipment such as fuel-handling tools stored in the RER was placed into three scrap drums and a 2.44 meter long x 1.22 meter x 1.22 meter (8 ft x 4 ft x 4 ft) wooden box and transferred to the old hardstand for storage. The floor, walls, ceiling, and remaining equipment such as storage cabinets were decontaminated by hand wiping, scrubbing, deck brushing, and hydrobrushing. The cell was painted on March 25, 1972.

Additional decontamination work was required on June 21, 1972 when a hydraulic hose in the RER leaked, contaminating the cell. The hydraulic oil used at the site was manufactured by Esso until 1968 and then by Getty Oil until 1985 (Wiedemann 1993). The oil is currently manufactured by Texaco and does not contain PCBs (Jackson 1993). The contamination in the RER was reduced, but a leak of scrubber water from the ventilation washer on July 7, 1972 recontaminated the cell. Decontamination of the cell was completed on September 19, 1972.

Between April 24 and June 8, 1974 the RER was swept out, mopped, and hydrobrushed, and storage cabinets and remaining equipment removed. The cell was sprayed with hot Organisol® and two coats of Rustoleum® were applied to the entire cell.

The decontamination activities in the RER were almost exclusively mopping and hydrobrushing. The cleaning agent Chem-clean was used during hydrobrushing and mopping of the RER.

3.2.3 Current Conditions

The last manned entry into the RER was on September 23, 1993. The RER and the TRU drums were in good physical condition and the floor was dry (Armknecht 1994). The RER is inspected on a yearly basis to observe the condition of the thirty TRU waste drums. All of the pushout rams, hydraulic units, and miscellaneous equipment was removed from the RER in the early 1980s.

3.2.4 Conclusions: Potential for Release

Based on this review, there are no indications that RCRA hazardous waste or hazardous constituents were managed in the RER. Other than hydraulic oil for the push-out rams, chemicals were not used in the RER during fuel reprocessing operations. The decontamination solutions Organisol® and Chem-clean were used during the decontamination of the cell. These solutions would have been flushed through the floor drains to the interceptors, lagoons 1 and 2, the low-level waste treatment facility, and lagoons 4 and 5 before discharge to lagoon 3 and Erdman Brook.

The RER is currently used to store thirty drums. Six of the drums store a small amount of $Pu(NO_3)_4$. The remaining twenty-four drums are scheduled to be transferred to the on-site LAG storage facility. Release of this material to the environment is considered unlikely since the bottles and beakers are stored in absorbent-filled metal pails overpacked into 113-liter (30-gal) pails that are overpacked in the TRU containers. The crystalline material in the 1-liter polyethylene bottles is also doubly overpacked in the TRU containers. The condition of the TRU containers is inspected yearly, with the last inspection conducted on September 23, 1993. The containers, floors, and walls in the RER were observed to be in good condition during this inspection. NO further action is proposed for the ram equipment room.

3.3 General Purpose Cell

The general purpose cell (GPC) is located belowgrade under the north end of the PMC and the chemical process cell (CPC) at a plant elevation of 22.86 meters (75 ft) (Figs. 3 and 3a). The GPC also underlies the south end of the scrap removal room (SRR). The GPC was equipped to transfer sheared fuel from the process mechanical cell to the chemical process cell for chemical processing. The GPC was also used to transfer scrap from the PMC and leached cladding from the CPC to the scrap removal room. Chemicals were not used in the GPC during reprocessing operations.

3.3.1 Cell Description and Control Features

The GPC is constructed of reinforced concrete and is 13.89 meters (45.583 ft) long, 3.17 meters (10.417 ft) wide, and 5.94 meters (19.5 ft) high (Burn 1983). The north wall is 1.22 meters (4 ft) thick and is composed of high-density concrete (280 lb/ft^3). The east, south, and west walls are made of ordinary concrete and are 1.27 meters (4.167 ft), 1.22 meters (4.0 ft), and 1.07 meters (3.5 ft) thick, respectively (Burn 1983). The concrete ceiling is 1.68 meters (5.5 ft) thick.

The concrete floor is 0.51 to 0.91 meters (1.67 to 3.0 ft) thick and is lined with stainless steel, which extends 4.88 meters (16.0 ft) up the walls of the cell. The floor slopes to a stainless steel-lined floor sump located 2.4 meters (8 ft) from the east end of the GPC at a plant elevation of 22.4 meters (73.5 ft).

The sump received liquids from the GPC and liquid from the floor drains in the PMC. The sump was equipped with a level indicator and both high and low-level alarms. The sump contents were transferred by two steam eductors (2H-1, 2H-2) via a 5-centimeter (2-in) diameter line to the hold side of 4D-10, the first uranium cycle waste tank, located in the liquid waste cell (LWC). There is no underground piping beneath the GPC.

The GPC has three shielded viewing windows, located in the north wall of the GPC, that allow viewing from the general purpose cell operating aisle (GOA). The windows are approximately 1 meter (3.28 ft) square and contain five panes of leaded glass that are about 0.25 meters (10 in) thick. The space between the panes is filled with LP-150, the pharmaceutical grade white mineral oil used in the PMC windows. A MSDS for LP-150 is provided in Appendix A. One of the windows reportedly is leaking (Vance 1986).

The GPC is accessible from the following five locations:

1) a 1.22-meter x 0.91 meter ceiling hatch (4 ft x 3 ft) at the east end of the GPC that connects to the PMC. This hatch is currently open, allowing air to flow from the PMC to the GPC.

2) a 0.2-meter (8-in) diameter chute that connects the GPC fuel basket loading station to the PMC shear. The chute is currently open.

3) a 0.76-meter x 1.6-meter (2.5 ft x 5.25 ft) ceiling hatch in the southwest corner of the GPC that connects to the CPC. This hatch is currently open, allowing air to flow from the CPC to the GPC.

4) a 1.0-meter x 1.22-meter (3.25 ft x 4.0 ft) ceiling hatch at the northwest corner of the GPC that connects to the scrap removal room. The hatch is operable and is currently closed.

5) a 3.0 x 4.6 x 0.76 meter (10 x 15 x 2.5 ft) vertical lift shield door at the west end of the GPC that connects to the general purpose crane room (GPCR). This door is partly open and is inoperable (Vance 1986).

The GPC is ventilated by the head end ventilation system and is the next-to-the-last destination for air in this system. The GPC receives airflow from the PMC, CPC, SRR, MC, WMOA, and the EMOA. Air discharges from the PMC into the GPC through the 0.9-meter x 1.2-meter (3 ft x 4 ft) floor hatch at the east end of the GPC at a flow rate of approximately 2,000 ft^3/min (cfm). A smaller volume of air enters the GPC through the 0.2-meter (8-in) diameter shear discharge chute. Air is discharged from the GPC through a 0.90-meter (36-in) duct to the head end ventilation system exhaust filter inlet plenum in the head end ventilation building. The air passes in sequence through a four-stage filter train composed of a prefilter, a roughing filter, and two banks of HEPA filters. Each HEPA filter is designed to remove at least 99.95% of particulates that are 0.3 micron (0.0003 mm) in diameter and larger. The air effluent exiting the HEPA filter is transferred by duct to the main stack where it commingles with other plant exhaust air streams and is released to the atmosphere. The air effluent exiting the stack is routinely sampled and monitored.

3.3.2 Historical Operations and Decontamination Activities

3.3.2.1 Historical Operations

The GPC was equipped to receive and handle sheared radioactive fuel and fuel scrap from the PMC and leached fuel hulls from the CPC. The principal equipment in the GPC included fuel baskets, the fuel basket loading station, the chopped fuel basket storage and cooling station, a 2-ton capacity crane mounted on rails 5 meters (16.5 ft) above the floor, a power manipulator, master/slave manipulators, and an examination table for fuel scraps. All equipment in the GPC was remotely operated from the general purpose cell operating aisle (GOA). The loading station, fuel basket storage and cooling rack, and the drive units are currently out-of-service. Table 4 summarizes the original equipment in the GPC.

The east end of the GPC was designed to receive sheared radioactive fuel and fuel scrap from the PMC. Sheared fuel from the PMC dropped through the bundle shear drop chute into a stainless steel fuel basket positioned in the fuel basket loading station. The fuel baskets were cylindrical with an 8-inch internal diameter and were 2.28 meters (7.5 ft) tall. The basket side walls were 0.625-centimeter (0.25-in) thick perforated 304L stainless steel plate.

The baskets were lined with a carbon steel liner that confined the fine particles generated during shearing and prevented their release during transport to storage and eventually to the CPC.

After the basket was loaded, the station repositioned the fuel basket so the GPC bridge crane could lift the basket to the chopped fuel basket storage and cooling station where seven full baskets could be stored. The GPC crane would lift a basket from the storage station and transport it to the loaded fuel basket transfer socket in the southwest corner of the GPC located directly below the hatch connecting the GPC with the CPC.

The west end of the GPC was designed for the transfer of fuel, leached cladding, and scrap between the GPC and the CPC and SRR. The CPC crane would lift a basket from the transfer socket through the hatch into the CPC and load the basket into a dissolver. After the fuel had dissolved, the cladding that remained in the CPC dissolvers would be transferred back to the GPC.

Before transfer back to the GPC the cladding would be rinsed with dilute nitric acid after the dissolver solution had been transferred to the feed adjustment and accountability tank (3D-1) in the CPC. The nitric acid rinse was also transferred to 3D-1. Beginning in late 1967 the baskets of leached cladding were immersed in a 1M caustic solution to prevent the Zircaloy hulls from self-igniting during inspection in the GPC (Lewis 1968).

The CPC crane would remove the fuel baskets containing the cladding from the dissolver and lower the baskets into the fuel basket transfer station in the GPC.

The GPC crane would remove the baskets and place them in the basket carrier of the leached hull dumping and sampling station. The hulls would be remotely dumped into the hopper section where they would be visually inspected to determine the completeness of dissolution. In late 1967 the leached cladding self-ignited on three occasions after dumping (Lewis 1968). The 1M caustic bath apparently corrected the self-ignition problem. The hulls were then dumped into 30-gallon scrap drums, sealed, and temporarily stored in the GPC. The scrap drums would be transported to the scrap removal room where they were loaded into a heavily shielded scrap cask and then transported to the NDA for burial.

Because of the pyrophoric nature of the Zircaloy cladding the GPC was equipped with a pressurized CO_2 gas and Met-L-X dry powder fire suppression system. Two of the cladding fires in the hopper section were extinguished with the Met-L-X system, while the third fire self-extinguished (Lewis 1968). The CO_2 and Met-L-X were stored in the general purpose cell operating aisle. Both systems are currently inoperative.

The GPC is not currently being used other than to store three 30-gallon vacuum canisters that contain material vacuumed off of the floor of the chemical process cell during its decommissioning. The canister contents have not been characterized. There are no plans for future use of the GPC because of the high radiation levels in the cell. Radiation levels in the GPC are discussed in section 3.3.3.

3.3.2.2 Decontamination and Decommissioning Activities

A general cleanup of the GPC was conducted in 1972 (Riethmiller 1981). The cleanup involved picking up spilled items such as hulls and analytical waste bottles with "clam-shell" type scoops and "fishing hooks," removal of drums containing hulls and waste, closing open drums, and transferring waste from damaged drums to undamaged drums. The bottles originated in the analytical cells and were transferred in sequence through the PMC, GPC, and scrap removal room before being disposed in the NDA.

A total of 105 drums of hulls and waste were removed from the GPC (Riethmiller 1981). Most of the waste was transferred to 4 ft x 4 ft x 8 ft wooden boxes that were buried in the NDA. There also were twenty-six transfers of NPR fuel baskets between the PMC and the scrap removal room. The GPC was not flushed with any type of decontamination solution during the cleanup. Cleanup or decontamination activities have not been conducted in the GPC since 1972.

3.3.3 Current Conditions

There are no records of manned entries into the GPC since 1966, so a detailed assessment of the condition of the cell is unavailable. However, a remote in-cell visual inspection, radiation survey, and sampling of the GPC was performed in early 1986 (Vance 1986).

The visual inspection was performed with an auto-focusing color television camera equipped with adjustable wide-angle and telephoto lenses. The cameras were inserted into the GPC through the 25-centimeter (10-in) diameter master/slave manipulator ports in the general purpose cell operating aisle, suspended from the GPC crane, and transported through the cell.

The following process equipment was observed in the GPC (Vance 1986):

- chopped fuel loading station
- chopped fuel storage and cooling rack
- cooling unit
- fuel basket storage sockets
- criticality guard rails
- hulls dump, sampling, and packing station

The visual survey indicated that unprocessed fuel was not present in the chopped fuel storage and cooling rack. Liquid and debris, including an overturned table, drums, drum lids, fuel hulls, and miscellaneous other items, were observed in the GPC sump. The composition and source of the liquid in the sump is unknown.

The radiation survey used both mid-range (0.1 R/hr to 200 R/hr) and high-range (10 R/hr to 20,000 R/hr) beta-gamma ion-chamber radiation probes. The probes were inserted into the GPC through the 25 centimeter (10-in) diameter MSM ports, suspended from the GPC bridge crane, and moved throughout the cell. A gross intensity and a collimated radiation survey was performed in the GPC (Vance 1986).

The gross intensity survey (Fig. 8), which used an unshielded high-range probe suspended 1.8 meters (6 ft) above the cell floor, measured gross beta-gamma intensities in a thirty-three-sector survey grid in the cell. At 1.8 meters (6 ft) above the cell floor gross beta-gamma radiation intensity ranged from 40 R/hr to 340 R/hr. The highest intensity was measured at the southeast corner of the cell near the fuel loading station where sheared fuel from the PMC was dropped into the fuel baskets. Radiation levels of 650 R/hr at 0.6 meters (2 ft) above the floor in this area suggest that fuel-bearing hulls may be on the floor of the cell. These hulls probably missed the fuel baskets during loading and fell to the floor.

The collimated survey used both medium- and high-range probes mounted in a collimating fixture with beta shielding over the probes. This survey measured the gamma radiation intensity in the same thirty-three-sector survey grid used in the gross radiation intensity survey. At 1.8 meters (6 ft) above the floor of the cell gamma radiation intensity ranged from 3.3 R/hr to 39.9 R/hr (Fig. 9). The highest gamma intensity was measured in the southeast corner of the cell near the fuel loading area.

Five samples of loose solids in the GPC were collected from May 22 to May 23, 1986 (Fig. 10). The samples were collected with a vacuum sampling device suspended from a crane hook similar to that used in the PMC. Cesium-137 was the principal source of radiation in the GPC. The transuranic radionuclides Pu-238, Pu-239/240, and Am-241 also contributed to the activity in the cell.

A liquid sample was collected from the sump on May 27, 1986 using a sponge attached to a lifting bale suspended from a crane hook. The sponge was dipped into the liquid and transferred to the analytical cells for radionuclide analysis (Table 5). The fission products cesium-137 and strontium-90 were the primary sources of activity in the liquid.

The liquid was not chemically analyzed. Table 5 indicates that the sample completely evaporated during sample preparation but does not imply that volatile organics were in the sump.

A 1994 visual inspection indicated the sump was completely filled with liquid. The liquid was not sampled but is believed to be water that has entered the GPC.

3.3.4 Conclusions: Potential for Release

Chemicals were not used during reprocessing operations or during clean-up activities in the GPC. However, analytical waste bottles were removed during the 1972 clean-up of the cell and the 1986 visual inspection indicated that a significant amount of debris, including an overturned table, drums, lids, fuel hulls, and other metal objects, were present in the sump area. The contents of the bottles is unknown. The radiation survey suggested that spent fuel debris may be present on the floor in the southeast corner of the GPC near the fuel basket loading station. Pyrophoric material such as the Zircaloy fuel cladding may also be on the floor throughout the cell. The Zircaloy fuel cladding transferred from the CPC was rinsed with dilute nitric acid and 1M caustic solution to negate its pyrophoric property, but it is unlikely that significant quantities of acid or caustic was transferred to the GPC. Any acid or caustic introduced into the GPC would have been evaporated by the air flow through the cell.

Low Pour-150 oil (LP-150), a pharmaceutical grade white mineral oil, is currently leaking from one of the shielded viewing windows in the GPC. However, LP-150 does not contain any RCRA hazardous constituents nor is it classified as a RCRA-listed or characteristic waste.

Based on this review there are no indications that RCRA hazardous waste or hazardous constituents were managed in the GPC. The fuel cladding and saw fines would not be regulated under RCRA pursuant to the Atomic Energy Act (AEA) by-product exclusion. There are no known releases of any material to the environment from the GPC. Releases to the underlying sand and gravel are considered unlikely since the cell is lined with welded stainless steel and the concrete floor is 0.51 meters to 0.91 meters (1.67 to 3.0 ft) thick. If any sample bottles containing liquid chemicals are present in the GPC their contents have probably evaporated and discharged through the head end ventilation system. Any fine material that may have become airborne would have been removed by the roughing and HEPA filters in the head end ventilation filtration system before being discharged from the main stack. No further action is proposed for the general purpose cell.

3.3.5 Associated Rooms

3.3.5.1 General Purpose Cell Crane Room (GCR) and Crane Room Extension

The General Purpose Cell Crane Room (GCR), located west of the GPC, originally measured 3.05 meters (10 ft) wide by 3.73 meters (12.25 ft) long. The GCR is positioned below grade at elevation 22.4 meters (73.5 ft). The GCR was lengthened in 1971 to facilitate crane and manipulator storage. This crane room extension, situated at elevation 26.36 meters (86.5 ft), augmented the upper portion of the GPCR by 4.88 meters (16 ft). The floor, ceiling and walls range from 0.61 meters (2 ft) to 1.22 meters (4 ft) thick. The crane room is separated from the GPC by a 0.76 meter (2.5 ft) shielding wall and vertical lift door.

Features of the GCR include a work platform 3.96 meters (13 ft) above the floor to allow worker access to the crane; spray headers for washing radioactive contamination from the crane, PAR, bridges, and motors; and gear boxes for the GPC-GCR door jacks. A concrete vault located at the west end of the GCR extension contains a 22,450 liter (5,930 gal) tank (12-35104) used to collect free-flowing drainage from all the crane rooms, including, the Chemical Process Crane Room (CCR), the Equipment Decontamination Room (EDR), the PMC Mechanical Crane Room (MCR), and the Scrap Removal Room. The tank also collected liquid from the CPC-EDR door slot. The solutions were transferred to the waste evaporator feed tank 7D-2 by eductor 15H-5. Condensate from these cells continues to be collected in tank 12-35104 in small quantities, although the tank is no longer routinely used for water management in the Process Building. The tank is equipped with a level recorder and a high level alarm. Records are maintained for all transfers from this tank.

The containment vault for tank 12-35104 is constructed of concrete. The walls and precast cover tops are 0.30 meter (1 ft) thick, while the floor of the vault is 0.61 meter (2 ft) thick. The precast covers are sealed with a water proof membrane. The bottom of the vault is located at elevation 26.36 meters (86.67 ft). Tank 12-35104 is constructed of 304L stainless steel with continuous fusion welding on both sides of the joint where possible. Full-penetration butt welding was used where welding from both sides was not possible. There are five lines to and from the tank. In addition, a vent/overflow is located at the top front of the tank. (Drawing 2401-12-35104-1 and 2401-12-212-2).

The GCR can be entered from the General Operating Aisle through an airlock measuring 3.96 meters x 1.52 meters x 6.71 meters (13 ft x 5 ft x 22 ft) high. There is a 0.89 meter x 1.75 meter (2.91 ft x 5.75 ft) hatch and a 0.71 meter x 0.76 meter (2.33 ft x 2.5 ft) hinged hatch on the elevated platform. A viewing window installation on the north wall at 28.14 meters (92.33 ft) was never completed.

The GCR was used for contact maintenance work on the GPC crane, power manipulator, and the GPC-GCR door mechanism and also allowed for remote decontamination of the crane and the power manipulator. The equipment was typically decontaminated prior to routine maintenance activities. Chemicals used in decontamination were TURCO® 4518, TURCO® 4521, and Alconox® detergent. The decontamination solutions were collected in tank 12-35104 and subsequently transferred to 8D-2 for management.

The GCR and extension was decontaminated by hydrobrushing, deck brushing, and scrubbing by NFS. The quantity and type of decontamination solutions were not recorded with one exception, when the area was scrubbed with a "caustic" solution. However, because the decontamination work was performed using a hydrobush, the actual volumes used are thought to be insignificant.

There are no records to indicate that a failure of the walls, floor, or sump occurred during operation, nor do the chemicals used in this area meet the definition of a RCRA hazardous waste or hazardous constituents. Although tank 12-35104 continues to be used on an intermittent basis, transfer records do not indicate that there has been any release from this tank, hence no further action is proposed at this time.

3.4 Miniature Cell

The miniature cell (MC) is located east of the GPC below grade at a plant elevation of 23.32 meters (76.5 ft) (Fig. 3a). The MC is not being used at present and was not used for any purpose during fuel reprocessing.

3.4.1 Cell Description and Control Features

The MC is of concrete construction and is 3.35 meters (11 ft) wide, 4.11 meters (13.5 ft) long, and 5.49 meters (18 ft) high (Burn 1983). The north wall is 1.07 meters (3.5 ft) thick, the east wall is 0.46 meters (1.5 ft) thick, the south wall is 0.61 (2 ft) thick, and the west wall is 1.07 meters to 1.57 meters (3.5-5.167 ft) thick. The ceiling is 1.68 meters (5.5 ft) thick.

The floor is 0.61 meters (2 ft) thick and covered with stainless steel. The floor slopes to a stainless steel-lined sump located in the southwest corner of the MC. The sump was designed so that liquids would be transferred by an eductor to tank 7D-14, the hot analytical cell drain catch tank, located in the liquid waste cell. However, at present the sump and 7D-14 are not connected. There is no underground piping beneath the MC.

A lead glass viewing window in the north wall of the MC allows viewing from the general purpose cell operating aisle. The window contains four panes of 15- to 27.5-centimeter (6-11 in) thick leaded glass (West Valley Nuclear Services 1993). The space between the panes is filled with the same white mineral oil that is present in the PMC and GPC shield windows.

The MC can be accessed at the following three locations:

1) a labyrinth-type air lock and a shield door at the northeast corner of the MC that connects to the general purpose cell operating aisle.

2) a shielded transfer slot over the viewing window that allows objects up to 10-centimeters (5-in) diameter to be passed between the MC and the general purpose cell operating aisle.

3) a 51-centimeter (20-in) vertical transfer chute in the ceiling in the northwest corner of the MC that connects to the PMC.

The MC is ventilated by the head end ventilation system and receives its air flow from the general purpose cell operating aisle. Air is discharged from the MC to the GPC and then to the head end ventilation building, where it is filtered before being released through the main stack.

3.4.2 Historical Operations and Decontamination Activities

3.4.2.1 Historical Operations

The MC was not used during fuel reprocessing operations and it never contained any process equipment (Burn 1983). It was designed and built for possible use as an experimental, research, or special project area. The only equipment present in the MC is a 1-ton monorail hoist that traverses the length of the MC on rails located 5.18 meters (17 ft) above the cell floor. The original equipment in the MC is listed in Table 6.

The MC is currently not in use.

3.4.2.2 Decontamination and Decommissioning Activities

Decontamination and decommissioning activities have not been conducted in the MC since reprocessing operations ceased.

3.4.3 Current Conditions

There have not been any manned entries into the MC since 1966, so a detailed description of the condition of the cell is not available. The floor of the MC is reportedly covered with radioactive dust which infiltrated from adjacent cells during operations.

The dose rate in the cell is estimated to be 1 R/hr to 2 R/hr (Jacoby June 1982) with a estimated total activity of 2.82 Ci (Goodman December 5, 1985).

3.4.4 Conclusions: Potential for Release

The MC was not used during reprocessing nor is it being used at present. Chemicals were not used in the MC and none are believed to be currently present. No further action is proposed for the miniature cell.

3.5 Extraction Cell No. 1

Extraction cell No. 1 (XC-1) is located at the southeast corner of the CPC at a plant elevation of 30.48 meters (100 ft). (See Fig. 3.) The uranium and plutonium in the dissolved nuclear fuel was separated from the fission products in XC-1 using a solvent extraction process. A second solvent extraction cycle in XC-1 separated the uranium from the plutonium.

3.5.1 Cell Description and Control Features

XC-1 is 4.88 meters (16 ft) wide, 5.03 meters (16.5 ft) long, and 16.76 meters (55 ft) high (Burn 1983). The concrete floor is 0.91 meters (3 ft) thick and lined with a 304L stainless steel that extends up the walls to a height of 0.46 meters (18 in), providing a spill containment volume of approximately 11,215 liters (2,960 gal). The remainder of the walls and the ceiling are carboline-coated concrete.

A stainless steel-lined floor sump is located about midway along the north wall of XC-1. The sump is equipped with a level indicator, high-level alarm, and a steam eductor. The sump received liquids released in XC-1 during operations and liquids that drained from three pump niches in the lower warm aisle that housed the HAF valve, the 4G5-5A feed pump, and the 4G9-9A organic pump (Riethmiller 1981).

During reprocessing, liquids in the sump were transferred by steam eductor 15H-9 to the "hold" side of the partition cycle waste tank (4D-2) in XC-1. Depending on the concentration of uranium and plutonium in the liquid in 4D-2, it was routed to either the high-level waste evaporator feed tank (7D-1) in XC-1 or to the rework evaporator feed tank (7D-8) in the liquid waste cell. The effluent in 7D-1 would be transferred to the high-level waste evaporator (7C-1) in the CPC and then to tank 8D-2 in the high-level waste storage tank farm.

Although XC-1 is no longer in operation provisions exist for emptying the sump in the unlikely event that liquids enter the cell. The sump can currently be jetted to 4D-2, to 7D-1 in XC-1, and then to tank 8D-2.

The south wall is 1.60 meters (5.25 ft) thick, the north and west walls are 1.52 meters (5.0 ft) thick, and the east wall is 0.91 meters (3.0 ft) thick. The ceiling is 1.52 meters (5.0 ft) thick. Access to XC-1 is through a 1.52-meter (5-ft) square hatch in the ceiling that connects with the extraction chemical room (XCR).

There is no underground piping beneath XC-1. There are approximately one hundred penetrations of the walls and ceiling of XC-1 that accommodate process and utility piping.

XC-1 is ventilated by the main ventilation system and receives airflow from the lower warm aisle (LWA) via the pump niches. During fuel reprocessing, air was discharged from XC-1 to the ventilation wash room washer that is now out-of-service. Air from XC-1 currently bypasses the ventilation wash room washer to the main ventilation exhaust plenum, passing through thirty roughing filters and thirty HEPA filters before discharging through the plant main stack.

3.5.2 Historical Operations and Decontamination Activities

XC-1 contains the partition cycle extraction columns, feed and waste tanks, and other vessels and piping that were used in the partition cycle of the solvent extraction system (Table 7). All of the equipment in XC-1 is constructed of 304L stainless steel.

3.5.2.1 Historical Operations

The three extraction cells, XC-1, XC-2, XC-3, and the product purification cell (PPC) used a solvent extraction process to extract uranium and plutonium from the dissolved nuclear fuel. The sheared nuclear fuel produced in the PMC was dissolved with concentrated nitric acid in one of two dissolvers in the CPC. The dissolver solution was an aqueous nitric acid solution that contained dissolved uranium, plutonium, fission products, and small amounts of neutron activation products (Nuclear Fuel Services, Inc. 1973).

The solvent extraction system was designed to process 2,500 kilograms of uranium and 50 kilograms of plutonium per day (Nuclear Fuel Services 1973). The solvent extraction process was comprised of five cycles: partition cycle, first uranium extraction cycle, second uranium extraction cycle, first plutonium extraction cycle, and the second plutonium extraction cycle.

Partition cycle operations were conducted in XC-1. The partition cycle used an organic solvent solution composed of 30% tributyl-phosphate (TBP) dissolved in n-dodecane to separate the uranium and plutonium from the fission products in the dissolved fuel and to separate the uranium from the plutonium.

The dissolver solution was transferred from the feed adjustment and accountability tank (3D-1) in the CPC to the partition cycle feed tank (4D-1) in XC-1 (Table 7). The solution was then transferred from 4D-1 to the partition cycle extraction column (4C-1) in XC-1. The TBP solution was pumped from solvent storage tank 1 (13D-4) in XC-2 (Table 8) into the bottom of 4C-1 while a nitric acid scrub stream from the extraction chemical room was added to the top of 4C-1.

The uranium and plutonium in the dissolver solution was present as $UO_2(NO_3)_2$ and $PuO_2(NO_3)_2$. These nitrates formed complexes with TBP in the following manner: $MO_2(NO_3)_2$ * $(TBP)_2$. More than 99.5% of the uranium and plutonium in the dissolver solution would partition into the organic phase. After sufficient time to allow for the separation of the organic and aqueous phases, the organic phase would exit the top of 4C-1 and be transferred to the bottom of partition column 4C-2.

The majority of the fission products (>99.9%) would remain in the aqueous phase waste stream and exit the bottom of 4C-1 to the 4C-1 aqueous decanter (4Y-1), where any remaining organic phase was separated from the aqueous stream. The aqueous stream was collected in the partition cycle waste catch/hold tank (4D-2) in XC-1. (See Table 7.)

The solution in 4D-2 was sampled for uranium and plutonium content. If the uranium and plutonium concentrations were sufficiently low and uneconomical for further reprocessing, the solution was transferred by eductor to the high-level waste evaporator feed tank (7D-1) in XC-1. The solution was then transferred from 7D-1 to the high-level waste evaporator (7C-1) in the CPC, and then to high-level waste tank 8D-2 in the high-level waste tank farm north of the process building. If the uranium and plutonium concentration was economical for reprocessing, the solution was sent to the rework evaporator feed tank (7D-8) in the LWC.

The organic phase in 4C-2 was combined with an aqueous phase containing nitric acid, ferrous sulfamate, and/or hydroxylamine nitrate added to the top of 4C-2 to reduce the plutonium from a +IV to a +III valence state. Pu(+III) is more soluble in the aqueous phase, resulting in the separation of plutonium into the aqueous phase from the uranium, which remained in the organic phase.

The plutonium in the aqueous phase would exit the bottom of 4C-2 to the top of the plutonium scrub column (4C-3) in XC-1, where it was scrubbed with fresh TBP/n-dodecane solvent (from tank 13D-4 in XC-2) to complete the separation of plutonium and uranium. The aqueous plutonium product stream would exit the bottom of the column and be collected in the plutonium feed conditioner (4D-6) located in XC-2, where it was prepared for solvent processing in the first plutonium-extraction cycle. (The first plutonium-extraction cycle operations are discussed in section 3.6.2.1.) The organic scrub stream, which contained small amounts of uranium, would be transferred back to 4C-2.

The uranium in the organic phase would leave the top of 4C-2 and be pumped to the bottom of the uranium strip column (4C-4) in XC-2 where the final stage of the partition cycle was completed and the uranium product stream was transferred to the first uranium-extraction cycle. The final stage of the partition cycle and the first uranium cycle solvent extraction process are discussed in section 3.6.2.1.

With the exception of tank 4D-2 all of the vessels and equipment in XC-1 are no longer in service. If there is any liquid in the sump, it can be emptied by a steam eductor to 4D-2. The contents of tank 4D-2 can be transferred to the high-level waste tank 8D-2 for management.

3.5.2.2 Decontamination and Decommissioning Activities

In order to complete the planned expansion work in XC-1 it was necessary to reduce radiation levels in the cell by decontaminating the cell and its vessels and piping. Decontamination activities in XC-1 began on March 11, 1972 (Riethmiller 1981).

3.5.2.2.1 Cell Decontamination

The interior of XC-1 was flushed with water from the three in-cell decontamination spray heads on ten different occasions between March 30 and June 29, 1972 (Riethmiller 1981). The spray heads are located near the center of the cell at approximate heights of 3.3 meters, 11 meters, and 16.76 meters (18 ft, 36 ft, and 55 ft). The flushes were 10 to 30 minutes in duration. On June 29, 1972 a manned entry from the ceiling hatch indicated a maximum radiation level in excess of 50 R/hr near tank 4D-1 at the second stair landing from the top of the cell.

XC-1 was sprayed with water another ten times between June 29, 1972 and February 20, 1973 (Riethmiller 1981). The final survey on February 21, 1973 indicated levels of 30 R/hr to 50 R/hr at the second stair landing and 10 R/hr to 50 R/hr at the first landing.

Chemicals were not used to decontaminate XC-1 through the in-cell decontamination spray heads during the 1972-1973 decontamination effort.

The floor and sump in XC-1 received decontamination solutions that drained from the pump and valve niches located on the lower warm aisle. The first decontamination effort was on May 21, 1972, when the 4G9-9A pump niche was flushed. The HAF check valve niche was flushed approximately ten times between August 1, 1972 and April 18, 1973. A 2,000-liter sodium tartrate solution flush was completed on March 19, 1973, followed by six water flushes by April 18, 1973. HAF refers to the feed solution from the chemical process cell that contained the dissolved plutonium, uranium, and fission products that was sent to XC-1 for solvent extraction.

XC-1 received only 2,000 liters of sodium tartrate solution during the decontamination of the HAF check valve niche. The total amount of chemicals used was 240 liters of 18 M sodium hydroxide and 40 kilograms of tartaric acid (Riethmiller 1981). An estimated

4,000 gallons of water were added to XC-1 through the in-cell sprays and 6,000 gallons, a conservative estimate, added through niche decontamination.

The water and decontamination solutions would have been pumped from the sump to the tank 4D-2, tank 7D-1, 7C-1, and then to tank 8D-2.

3.5.2.2.2 Vessel Decontamination

The following vessels and columns in XC-1 were decontaminated between March 11, 1972 and May 8, 1973:

4D-1 - Partition-cycle feed tank
4C-1 - Partition-cycle extraction column
4D-2 - Partition-cycle waste catch hold tank
4C-2 - Partition-cycle partition column
4C-3 - Partition-cycle Pu scrub column
7D-1 - High-level waste evaporator feed tank
4Y-14 - Head pot
4C-13A - Partition-cycle feed pump pot
4C-13B - Partition-cycle feed pump pot
4Y-5 - HAP surge tank
4Y-6 - HBU surge tank

The following type and volume of decontamination solutions were flushed through these vessels during this time period (Riethmiller 1981):

- Water: more than 400,000 liters
- Type 1 Decontamination Solution: 40,000 liters
- Type 2 Decontamination Solution: 54,000 liters
- 0.8 M aluminum nitrate ($Al(NO_3)_3$) decontamination solution: 5,000 liters

- 2 M nitric acid (HNO_3) - 0.05 M ammonium fluoride (NH_4F) decontamination solution: 18,500 liters

- Sodium tartrate decontamination solution: 12,000 liters

- Citric acid/nitric acid decontamination solution: 24,000 liters

- 2.0 M sodium hydroxide: 10,000 liters

- 0.25 M sodium hydroxide: more than 12,000 liters

- 0.05 M nitric acid: 12,000 liters

- 3.0 M nitric acid: unknown volume

- 1.5 M sodium nitrate: 2,000 liters

- 2.0 M sodium nitrate and 0.1 M sodium hydroxide solution: 2,000 liters

- 1 M nitric acid, 0.1 M ferrous sulfate, 0.05 M ammonium fluoride solution: 1,500 liters

- Steam flushing: unknown volume

The composition of the various decontamination solutions is as follows (Riethmiller 1981):

- Type 1 decontamination solution (1,000 liters):

    1) 500 liters of water heated to 150°F
    2) 200 liters of 18 M sodium hydroxide (NaOH)
    3) 100 lbs of potassium permanganate ($KMnO_4$)
    4) 55 lbs of potassium dichromate (KCr_2O_7)
    5) water at temperatures of 180°F-200°F added to make a total of 1,000 liters

- Type 2 decontamination solution (1,000 liters):

  1) 700 liters of water heated to 150°F
  2) 180 lbs of oxalic acid ($H_2C_2O_4$)
  3) 10 lbs of citric acid ($H_3C_6H_5O_7$)
  4) 10 lbs of tartaric acid ($H_6C_6O_4$)
  5) 8 lbs of sodium-nitrilotriacetate (NTA) $C_6H_6NO_6 \bullet 3Na$
  6) water at temperatures of 150°F-170°F added to make a total of 1,000 liters

- 0.8 M aluminum nitrate ($Al(NO_3)_3$) decontamination solution (1,000 liters):

  1) 700 liters of water
  2) 675 lbs of aluminum nitrate ($Al(NO_3)_3$)
  3) water added to make a total of 1,000 liters

- 2.0 M nitric acid (HNO_3) and 0.05 M ammonium fluoride (NH_4F) decontamination solution (1,000 liters):

  1) 870 liters of water
  2) 4 lbs of ammonium fluoride (NH_4F)
  3) 130 liters of 15 M nitric acid (HNO_3)

- Sodium tartrate decontamination solution (1,000 liters):

  1) 880 liters water
  2) 120 liters of 18 M sodium hydroxide (NaOH)
  3) 20 kgs of tartaric acid ($H_6C_6O_4$), heated to 150°F-170°F

- Citric acid/nitric acid decontamination solution (1,000 liters):

  1) 800 liters of water heated to 150 °F
  2) 108.5 liters of citric acid ($H_3C_6H_5O_7$)
  3) 19.3 liters of 15 M nitric acid (HNO_3)

The spent decontamination solutions were ultimately transferred in sequence to 4D-2, 7D-1, 7C-1, and 8D-2 for management.

3.5.3 Current Conditions

XC-1 was last entered in 1972 for a radiation survey. Since the manned entry was only to the second stair landing from the top of the cell, the physical condition of the cell is unknown. In 1978 a remote radiation survey was performed by lowering thermoluminescent dosimeters through the ceiling into the cell. The dose rate in the cell is reported to range from 4 R/hr at the top of the cell to 33 R/hr at the bottom (Riethmiller 1981; Burn 1983). The high dose rate at the floor was attributed to a dark particulate matter that was insoluble in water (Riethmiller 1981), while contaminated walls or tanks 4D-1, 4D-2, or 7D-1 are the source of radiation near the top of the cell (West Valley Nuclear Services 1993). The composition of the dark particulate matter is unknown but it may be process material remaining from the reprocessing operation. One or more vessels in the cell may still contain insoluble fuel particle residues (Burn 1983). A number of plugged lines, unflushed decanters, ventilation off-gas piping, and a probable sludge layer in 4D-1 may also contribute to the radiation levels (Riethmiller 1981).

3.5.4 Conclusions: Potential for Release

A number of chemicals were used in XC-1 during the partition cycle operations and decontamination of the cell. None of these chemicals have been identified as a RCRA hazardous constituent. Based on this review, there are no indications that RCRA-listed hazardous waste or hazardous constituents were or are managed in XC-1. Residual material that contributes to the measured dose rate in the cell may still be present in the vessels and on the floor of XC-1. It is not known whether this material is a RCRA characteristic waste since it has not been sampled and analyzed by TCLP methods. Regardless of its classification, the material is contained and confined within stainless steel vessels, and piping, and if any material were released it would be contained by the cell's welded stainless steel liner, which provides about 11,215 liters (2,960 gal) of spill containment.

There were no known releases of any material from XC-1 to the environment. There were no reported catastrophic releases from the partition cycle equipment during reprocessing that would have exceeded the containment capacity. Any liquids spilled during reprocessing would have drained to the sump and would have been transferred to tank 8D-2 for management. The volume of liquid added to the cell during in-cell decontamination was limited by the boil-off rate of the high-level waste evaporator (Riethmiller 1981) and did not exceed the cell's containment capacity. No further action is proposed for extraction cell No. 1.

3.6 Extraction Cell No. 2

Extraction cell No. 2 (XC-2) is a reinforced concrete cell located east of and immediately adjacent to XC-1 at a plant elevation of 30.48 meters (100 ft). (See Fig. 3.) XC-2 contains the solvent extraction columns and feed tanks for the last stage of the partition cycle, the first uranium cycle, and the first plutonium cycle. All of the equipment in XC-2 is constructed of 304L stainless steel. (See Table 8.)

3.6.1 Cell Description and Control Features

XC-2 is 6.32 meters (20.75 ft) wide, 6.4 meters (21.0 ft) long, and 17.37 meters (57.0 ft) high (Burn 1983). The floor is 0.91 meters (3 ft) thick and is covered with 304L stainless steel that extends up the walls to a height of 0.46 meters (1.5 ft), providing approximately 18,520 liters (4,890 gal) of spill containment. A stainless steel-lined sump is located in the floor midway along the west wall of the cell. Liquids in the sump are transferred to the liquid waste cell solvent waste hold tank 13D-8 by eductor 15H-10 (Riethmiller 1981).

The ceiling and the west, north, and south walls are 0.91 meters (3 ft) thick. The east wall is 0.46 meters (1.5 ft) thick. Access to XC-2 is through a 0.23-meter (0.75-ft) thick access door located at ground level in the cell access area.

Three pump niches in the lower warm aisle (Fig. 11) drain into the sump in XC-2:

- the plutonium-extraction column feed pump and spare (4G-33 and 4G-33A) and the #2 solvent system supply pump (13G-12)

- the spare solvent supply pump (13G-11A) and the #1 solvent system supply pump (13G-11)

- the organic feed pump to column 4C-10 (4G-26) and its spare (4G-26A)

Four niches in the upper warm aisle (Fig. 12) drain into the sump in XC-2:

- first solvent washer recirculation pump niche (13G-1 and 13G-2)

- second solvent washer recirculation pump niche (13G-3 and 13G-4)

- solvent cleanup pump niche (13G-14)

- solvent filter niche (13T-1)

There is no underground piping beneath XC-2. There are approximately fifty penetrations of the walls and ceiling of XC-2 that accommodate utility and process piping to and from the cell (Bechtel 1963).

XC-2 is ventilated by the main ventilation distribution system and receives its airflow from the east mechanical operating aisle via the cell access aisle. During fuel reprocessing, air was discharged to the ventilation wash room washer, which is currently out of service. The air discharge currently bypasses the washer to the main ventilation exhaust plenum, where it passes through thirty roughing filters and thirty HEPA filters before being discharged through the main stack.

3.6.2 Historical Operations and Decontamination Activities

The final stage of the partition cycle, the first uranium cycle, and the first plutonium cycle were conducted in XC-2. XC-2 was capable of processing low enriched uranium (3% U-235) at a rate of 1.0 ton per day and plutonium at a rate of 30 kilograms per day (Nuclear Fuel Services, Inc. 1973). XC-2 was also capable of recovering solvent used in the solvent extraction process at a rate equivalent to the fuel reprocessing rate. The equipment present in XC-2 during reprocessing is listed in Table 8.

3.6.2.1 Historical Operations

Final Stage Partition Cycle

The uranium in the organic phase would leave the top of 4C-2 in XC-1 and be pumped to the bottom of the uranium strip column (4C-4) in XC-2 (Table 8). Dilute nitric acid (0.01M) was added to the top of 4C-4, which caused the uranium to transfer into the aqueous phase as uranyl nitrate. The solvent waste and the aqueous waste stream containing uranium followed separate pathways. The solvent waste stream would exit the top of 4C-4 and flow to the first solvent cleanup system in XC-2. (See section 3.9.2.1.) The aqueous phase product stream containing the uranium would be transferred for further processing in the first uranium cycle.

First Uranium Cycle

The aqueous phase product stream from 4C-4, which contained 60-80 grams uranium per liter, was processed through the first intercycle evaporator feed tank and then to the first intercycle evaporator, where the uranium was concentrated to 250 grams of uranium per liter. The concentrate was cooled in the first intercycle evaporator cooler and then transferred by gravity to the first uranium cycle feed conditioner tank (4D-9) in XC-2.

Nitric acid was added to the aqueous solution in 4D-9 to achieve the proper acidity required for the first uranium cycle operations. The acidified aqueous uranium solution was transferred from 4D-9 to a measuring pot (4Y-24) and then to the first uranium cycle extraction column (4C-9) in XC-2 (Table 8).

Two nitric acid scrub streams were added to the top of 4C-9, one of which contained ferrous sulfamate and/or hydroxylamine nitrate, to reduce any plutonium remaining in the solution from the (+IV) to the (+III) valence state and separate plutonium to the aqueous phase from uranium, which transferred to the organic phase. While the nitric acid was added to the top of 4C-9, a TBP/n-dodecane solution from the No. 2 solvent system storage tank (13D-5) in XC-2 was pumped into the bottom of 4C-9. More than 99.5% of the uranium would partition to the organic phase and exit the top of 4C-9 to 4Y-21 and then be pumped to the bottom of the first uranium strip column (4C-10) in XC-3.

The aqueous stream would contain some plutonium and 99% of the fission products that entered the feed to the first uranium cycle. This stream was transferred to the 4C-9 aqueous decanter (4Y-9) and then to the first uranium cycle catch/hold tank (4D-10) in the liquid waste cell.

A strip solution of dilute nitric acid was pumped into 4C-10 to strip the uranium from the organic phase and into the aqueous phase. The aqueous phase would be sent to the second intercycle evaporator system in XC-3. The organic waste stream would exit the top of 4C-10 and flow to the No. 2 solvent system in XC-2 for cleanup.

First Plutonium Cycle

The aqueous plutonium product stream from the partition cycle was collected in the plutonium-cycle feed conditioner tank (4D-6) in XC-2 where the acid concentration was adjusted and sodium nitrate added to reoxidize the plutonium from a (+III) to a (+IV) valence state so the plutonium could be extracted into an organic phase. The plutonium product stream was put through two plutonium solvent extraction cycles, with the first being carried out in XC-2.

The aqueous feed solution containing plutonium, HNO_3, and small amounts of fission products was passed into 4Y-32 and then into the extraction section of the plutonium cycle extraction column (4C-7) in XC-2 (Table 8). A nitric acid scrub stream was added to the top of 4C-7 and a solution of TBP/n-dodecane from the No. 1 solvent storage tank (13D-4) in XC-2 would be pumped into the bottom of 4C-7.

Greater than 99.5% of the plutonium would partition to the organic phase and would exit the top of 4C-7 to 4C-8, the plutonium cycle strip column, in XC-2. A weak nitric acid-hydroxylamine nitrate strip solution would be added to the plutonium-containing organic phase in 4C-8. The strip solution would cause the plutonium to change its valence state from (+IV) to (+III) and transfer the plutonium back to the aqueous phase, which would then exit the bottom of 4C-8 and be transferred to the second plutonium-cycle feed conditioner tank (5D-1) in XC-3.

Approximately 99% of the fission products present in the feed solution to 4C-7 would partition to the aqueous waste stream exiting the bottom of 4C-7. This stream would pass through the 4C-7 aqueous decanter (4Y-7), where residual solvent was removed, and then to the plutonium cycle waste catch/hold tank (4D-8) in the liquid waste cell.

A 35% solution of hydrazine was added to 4C-8 instead of the nitric acid-hydroxylamine nitrate strip solution during a test conducted between March 11 and March 13, 1971. The test was conducted to evaluate the ability of hydrazine to decrease nitrite and plutonium concentrations in the organic phase in 4C-8.

3.6.2.2 Decontamination and Decommissioning Operations

Decontamination of the interior of XC-2 and its associated vessels and piping was necessary to complete the planned expansion of the reprocessing facility. Decontamination activities in XC-2 began on March 30, 1972 and were completed on June 17, 1972 (Riethmiller 1981). Decontamination included remote spraying of the cell, followed by scrubbing and mopping with decontamination solutions after radiation levels were reduced.

3.6.2.2.1 Cell Decontamination

The decontamination of the interior of XC-2 began on March 30, 1972, when the cell was flushed five times with water from the in-cell decontamination spray heads. XC-2 is equipped with three in-cell decontamination spray heads located in the middle of the cell at the top and at one-third and two-thirds heights above the floor of the cell. Decontamination activities in XC-2 were done remotely through the in-cell decontamination spray heads; after XC-2 was entered decontamination activities were carried out manually.

The interior of XC-2 was flushed and manually scrubbed with the following solutions (Riethmiller 1981):

Sodium tartrate decontamination solution: 18,000 liters
0.2M oxalic acid: 2,000 liters
Type 1 decontamination solution - 1,500 liters

Type 2 decontamination solution: 2,000 liters

Radiac/NTA decontamination solution: 4,000 liters

Water rinses: > 75,000 liters

These volumes include the volumes of decontamination solution that drained to XC-2 during the cleanup of the upper warm aisle pump niches housing pumps 13G-1 and 13G-2 and pumps 13G-3 and 13G-4 (Riethmiller 1981).

These solutions drained to the XC-2 sump and were transferred by eductor to the solvent waste hold tank (13D-8) in the liquid waste cell. From tank 13D-8 the effluent would follow one of three paths. See section 3.9.2.1(i).

3.6.2.2.2 Vessel Decontamination

The first uranium cycle, the first plutonium cycle, the solvent storage tanks, and the solvent washers in XC-2 were flushed with decontamination solutions between March 23 and June 3, 1972 (Riethmiller 1981).

The first uranium cycle vessels in XC-2 — 4D-9, 4Y-24, 4C-9, 4Y-25, 4Y-9, and 4Y-21 (Table 8) — were flushed with the following decontamination solutions between March 23 and April 26, 1972:

1) Water - More than 60,000 liters
2) Type 1 solution - 10,000 liters
3) Type 2 solution - 10,000 liters
4) Sodium tartrate solution - 5,000 liters
5) Citric acid/nitric acid solution - unknown volume
6) 2M nitric acid (HNO_3) - 0.05M ammonium fluoride (NH_4F) solution - 8,000 liters
7) 0.8M aluminum nitrate ($Al(NO_3)_3$) solution - 2,000 liters
8) 1M nitric acid - 0.1M ferrous sulfamate - 0.05M ammonium fluoride solution - 1,500 liters
9) 0.6M aluminum nitrate solution - 500 liters

The waste solutions were routed to tanks 4D-10 and 4D-13 in the liquid waste cell.

The plutonium cycle vessels in XC-2 – 4D-6, 4Y-32, 4C-7, 4C-8, 4Y-35, and 4Y-8 (Table 8) – were flushed with the following decontamination solutions in March and April 1972:

1) Sodium tartrate solution - 900 liters
2) Water - 2,700 liters
3) Partition cycle flushes - an unknown volume
4) 2M nitric acid (HNO_3) - 0.05M ammonium fluoride (NH_4F) solution - 8,000 liters
5) 0.8M aluminum nitrate ($Al(NO_3)_3$) solution - 2,000 liters
6) 1M nitric acid - 0.1M ferrous sulfamate - 0.05M ammonium fluoride solution - 1,500 liters
7) 0.6M aluminum nitrate solution - 500 liters

The waste solution was routed to tank 4D-8 in the LWC.

The solvent storage tanks in XC-2 – 13D-4, 13D-5, and 13D-18 (Table 8) – were flushed with the following decontamination solutions between April 4 and June 3, 1972:

Water - 55,000 liters
Type 1 solution - 8,000 liters
Type 2 solution - 8,000 liters
Sodium tartrate solution - 7,000 liters

The waste solutions were routed to tank 13D-7 and 13D-8 in the liquid waste cell.

The solvent washer vessels in XC-2 – 13D-1, 13D-2, 13C-1, 13C-2, 13C-4, and 13C-5 (Table 8) – were flushed with the following decontamination solutions between April 4 and June 3, 1972:

Water - 64,000 liters
Type 1 solution - 12,000 liters
Type 2 solution - 12,000 liters
Sodium tartrate solution - 2,000 liters

Waste solutions were routed to tanks 13D-7 and 13D-8 in the liquid waste cell.

3.6.3 Current Conditions

The last manned entry into XC-2 occurred in the mid-1980s and little information on the physical condition of the cell exists. The radiation levels in the cell reportedly range from 10 mR/h to 90 mR/hr (Burn 1983), with an estimated total radioactive content of 420 Ci (West Valley Nuclear Services July 29, 1993). The dose rate is approximately constant over a substantial portion of the cell, suggesting radiation sources are distributed throughout the equipment and walls of the cell and are not restricted to the floor (West Valley Nuclear Services July 29, 1993). One or more of the vessels in the cell may contain insoluble fuel residues to account for the radiation source. The floor is reportedly highly contaminated with loose material (Burn 1983).

3.6.4 Conclusions: Potential for Release

A number of chemicals were used during reprocessing and decontamination operations in XC-2. Hydrazine is the only chemical that has been identified as a RCRA hazardous constituent. Hydrazine was used in the plutonium cycle strip column (4C-8) during a 39-hour test in 1971. It is no longer believed to be present in the cell since it degrades when exposed to nitric acid. Nitric acid was used to decontaminate 4C-8 and other plutonium cycle vessels in XC-2 in 1972.

Based on this review there are no indications that RCRA-listed hazardous waste or hazardous constituents currently reside in XC-2. Residual material may still be present in the vessels and on the floor of XC-2 that contribute to the dose rate in the cell. It is not known whether this material is a RCRA characteristic waste since it has not been sampled and analyzed. Regardless of its classification, the material is contained and confined within stainless steel vessels and piping and if any of this material is released it would be contained by the cell's welded stainless steel liner that provides approximately 18,520 liters (4,890 gal) of spill containment.

There are no known releases of any material from XC-2 to the environment and are considered unlikely since the cell is lined with a welded stainless steel liner and the underlying concrete floor is 0.91 meters (3 ft) thick. There were no reported catastrophic releases of liquid from the equipment in XC-2 during reprocessing that would have exceeded the containment capacity of the liner.

Any spills or leaks during reprocessing and solutions used to flush the cell would have drained into the XC-2 sump and would have been transferred by eductor 15H-10 to tank 13D-8 in the liquid waste cell. The contents of 13D-8 followed one of three paths described in section 3.8.2.1(i). The volume of decontamination solutions added to XC-2 at any one time also did not exceed the containment capacity of the cell. No further action is proposed for extraction cell No. 2.

3.6.5 Associated Rooms

3.6.5.1 Product Packing and Shipping Area/Waste Reduction and Packaging Area

The former product packing and shipping area (PPS) is currently called the waste reduction and packaging area (WRPA). It is located east of the extraction cells in the southeast corner of the process building at a plant elevation of 30.48 meters (100 ft) (Fig. 3).

The product packing and shipping area (PPS) is 5.49 meters (18 ft) wide, 12.8 meters (42 ft) long, and 4.42 meters (14.5 ft) high (Burn 1983). The concrete floor drains to the product handling area. An airlock measuring 4.88 meters x 5.49 meters x 4.27 meters high (16 ft x 18 ft x 14 ft) at the south end of the PPS/WRPA connects to the product packing and handling area, lower warm aisle, and a 2.44 meter by 3.66 meter (8 ft x 12 ft) outdoor shipping dock.

The end products of the reprocessing operation were aqueous plutonium nitrate and uranium nitrate solutions. The solutions were packaged in ten liter shipping containers in the adjacent product packing and handling area and shipped by truck from the product packing and shipping area (PPS).

The WRPA is currently used as a low-level waste compaction area and is equipped with a 50-ton hydraulic trash compactor that compacts compressible, low dose rate, radioactively-contaminated materials into special metal bins. The following material is typically compressed: anti-contamination clothes, hoses, HEPA filters, herculite, wood, and lightweight metals such as aluminum that are generated in radioactively controlled areas.

Radioactively contaminated glassware from the laboratories was compacted in the past but this practice was discontinued in 1990. The solid waste compacted in the compactor is classified as radioactive non-hazardous waste and does not contain any listed waste based on available process knowledge. Waste designated for compaction has been screened and classified according to protocol specified in the following WVDP standard operating procedures (SOPs).

- SOP 009-05 - Operation of the Radioactive Waste Compactor
  - establishes methodology for operation of the radioactive waste compactor.

- SOP 009-02 - Solid Radioactive Waste Handling
  - establishes methodology for packaging and/or repackaging of low-level radioactive waste, transuranic waste, suspect transuranic waste and mixed waste generated at WVNS

- SOP 300-07 - Waste Status Determination
  - establishes methodology for classifying waste after it has been generated in accordance with Federal and State hazardous waste regulations and Department of Transportation regulations.

Compacted radioactive non-hazardous waste is currently stored in lag storage areas 1 and 4.

The waste receiving and packaging area is still being used to compact low-level non-hazardous radioactive waste in special metal bins. Based on this review, there are no indications that RCRA-listed hazardous waste or hazardous constituents are managed in the WRPA. There are no known releases of any material from the WRPA to the environment. No further action is proposed for this area at this time.

3.7 Pump Niches, Upper Warm Aisle

The upper warm aisle (UWA) is a reinforced concrete room next to the south wall of the extraction cells at a plant elevation of 34.90 meters (114.5 ft). (See Fig. 12.) The upper warm aisle contained shielded concrete niches that housed pumps and valves that were part of the reprocessing operations in the adjacent extraction cells. Two of the six pump niches are currently in use.

3.7.1 Cell Description and Control Features

The UWA is 4.88 meters (16 ft) wide, 27.43 meters (90.0 ft) long, and 5.64 meters (18.5 ft) high (Burn 1983). The floor, ceiling, east, west, and south walls are 1-foot thick. The north wall is 0.91 meters (3 ft) thick except where it is shared with XC-1, where it is 1.52 meters (5 ft) thick (Fig. 12). The UWA can be entered through a stairwell at its northwestern end or through an airlock from the lower extraction aisle (LXA) at its eastern end (Fig. 12). Equipment can be moved into and out of the UWA at its eastern end through a 0.91 meter x 1.52 meter (3 ft x 5 ft) hatch that connects with the lower warm aisle.

The UWA contains six concrete niches that house pumps, valves, and equipment that were used for the solvent extraction systems in the adjacent extraction cells (Allen 1986a). Three of the niches are next to XC-2, two are next to XC-3, and one is next to both XC-2 and XC-3 (Fig. 12).

The niches are 1.22 meters (4 ft) high and are about 2.18 meters (7 ft) wide, extending approximately 1.83 to 3.05 meters (6 to 10 ft) into the UWA from the wall separating the UWA from XC-2 and XC-3. The concrete walls of the niches are 0.30 to 0.53 meters (12 to 21 in) thick. The floors and walls of each niche are lined with 1.91-millimeter (0.0751 in) thick stainless steel. The niches are equipped with 76.2-millimeter (3-in) diameter piping that drain the niches to either XC-2 or XC-3. The niches are capped with a 0.30-meter (1.0 ft) thick reinforced concrete cover.

A 5-ton bridge crane in the UWA is used to lift the niche covers and to move equipment in the UWA.

3.7.2 Historical Operations and Decontamination Activities

3.7.2.1 Historical Operations

The six UWA pump niches housed the following equipment:

1) First solvent washer recirculation pumps (13G1 and 13G2)
2) Second solvent washer recirculation pumps (13G3 and 13G4)
3) Third solvent washer recirculation pumps (13G5 and 13G6)
4) Solvent cleanup pump (13G14)
5) Solvent filter (13T1)
6) Solvent cycle valve manifold (SCVM)

This equipment was used to support operation of the first and second solvent washers (13D-1 and 13D-2) in XC-2 and the third solvent washer (13D-3) in XC-3. The washers cleaned the TBP/n-dodecane solvent used in the extraction cycles. Used solvent would be mixed with 0.2M Na_2CO_3 in the carbonate wash columns (13C-1, 13C-2, or 13C-3) in XC-2 and XC-3, and the solvent would then flow into the solvent washers (13D-1, 13D-2, or 13D-3) where it was mixed with an additional 0.2M Na_2CO_3. The pumps would recirculate the solvent and carbonate solution through the washer. Pump 13G14 and filter 13T1 were used to pump solvent into the carbonate wash columns.

Any solvent or sodium carbonate solution that leaked from the pumps would drain into either XC-2 or XC-3 via the 76.2 millimeter (3-in) diameter pipe in each niche. The niches containing 13G1, 13G2, 13G3, 13G4, 13G14, and 13T1 drained into XC-2 and are no longer in use. The niches containing 13G5, 13G6, and SCVM drained into XC-3. These two niches support operation of the liquid waste treatment system (LWTS).

3.7.2.2 Decontamination and Decommissioning Activities

In 1972 the pumps in the niches were flushed with the decontamination solutions that were put through the solvent storage tanks and solvent washers in XC-2 and XC-3. The type and volume of decontamination solution flushed through XC-2 is discussed in section 3.6.2.2. According to Reithmiller (1986) the XC-3 washer system was flushed with:

1) Water: more than 26,000 liters
2) Type 1 solution: 4,000 liters

3) Type 2 solution: 4,000 liters
4) Sodium tartrate solution: more than 2,000 liters

The composition of the decontamination solutions are reported in Section 3.5.2.2.2.

In late 1983 the tops of the niches were sealed by placing a 0.25-meter (10-in) wide sheet metal dike around the edges of the niches and filling the diked area with an expanding plastic foam. The diked area was covered with sheet metal (Allen 1986a).

In 1984 XC-3 and the product purification cell (PPC) were selected as the location for the liquid waste treatment system (LWTS). Since the UWA solvent cycle valve manifold and 13G5/13G6 pump niches were required to support operations in the LWTS, they were decontaminated between January 1985 and February 1986 (Allen 1986a). The niche covers were removed and the niches vacuumed. The floors, walls, and equipment were coated twice with a strippable fixative coating to remove radioactive contamination. The glass cleaner Windex® was also used where additional decontamination was required.

3.7.3 Current Conditions

The SCVM and 13G5/13G6 pump niches were decontaminated and the manifold and pumps removed. These niches are currently used to support operation of the LWTS. The stainless steel liners and their walls are reported to be in very good condition (P. Vlad pers. comm. 1994). The other four niches are still sealed with the 0.25-meter (10-in) sheet metal dike filled with plastic foam.

3.7.4 Conclusions: Potential for Release

The pump niches in the UWA housed pumps, filters, and valves used in the solvent wash operations in XC-2 and XC-3. The niches were stainless steel-lined and drained to the sumps in XC-2 and XC-3. The pumps circulated a mixture of TBP/n-dodecane and sodium bicarbonate through the solvent washers. The pumps also circulated decontamination solutions used during decontamination of the solvent storage tanks and solvent washer vessels in XC-2 and XC-3. None of the chemicals that circulated through the pumps have been identified as a RCRA hazardous waste or hazardous constituent.

Based on this review there are no indications that RCRA hazardous waste or hazardous constituents were managed in the UWA pump niches. The third solvent washer recirculation pump niche and the solvent cycle valve manifold niche were decontaminated and their equipment removed in 1986. There are no known releases of any materials to the environment from the UWA pump niches. The niches are lined with welded stainless steel and any releases from the pumps, filters, or manifolds would have been contained and drained to the floor and sumps in XC-2 and XC-3. Both sumps were emptied by eductor to tank 13D-8 in the liquid waste cell. The welded stainless steel liners and 0.9-meter (3-ft) thick concrete floors of XC-2 and XC-3 would have prevented material from being released to the environment. No further action is proposed for the upper warm aisle pump niches.

3.7.5 Associated Rooms

3.7.5.1 Solvent Storage Terrace

The solvent storage terrace (SST) was located on the south side of the process building on the roof of the upper warm aisle at a plant elevation of 39.93 meters (131 ft) (Fig. 13). The 18,925 liter (5,000 gal.) recovered acid storage tank (7D-5) and the three 13,250 liter (3,500 gal.) solvent waste storage tanks (13D-15, 13D-16, and 13D-17) were located on the SST during fuel reprocessing.

The recovered acid storage tank (7D-5) received nitric acid that was produced from the bottom of the acid fractionator located in the acid recovery cell. This acid was used in various stages of the reprocessing operation. The three solvent waste storage tanks received spent tributyl phosphate/n-dodecane solvent from the extraction cells. Excess uranium in the spent solvent was removed with a nitric acid stripping solution and a 2M sodium hydroxide wash solution before the solvent was transferred to the tanks. If further washing was required, the spent solvent was washed with a 2M nitric acid and oxalic acid solution.

The spent solvent in the tanks was drained to 3,785 liter (1,000 gal.) disposal tanks. Approximately 1,890 liters (500 gal.) of solvent was mixed with 50 bags of sorbent in each tank to prevent the occurrence of free liquid in the tank during disposal

(Blickwedehl et al. 1989). The sorbent was described by operating personnel as "kitty litter". When filled, the tanks were buried in the NRC-licensed disposal area (NDA).

Spills and leaks from these tanks during reprocessing radioactively contaminated the terrace. The terrace was equipped with a drain that conveyed any spilled material and precipitation via an underground drain line to the solvent dike, an unlined holding pond excavated into the sand and gravel unit near lagoon 1. The runoff from the SST was allowed to evaporate or seep into the sand and gravel unit. The operating history of the solvent dike is discussed in the RFI report for SSWMU #2, Miscellaneous Units. No further action is proposed for the solvent storage terrace.

3.7.5.2 Acid Handling Area

The acid handling area (AHA) was located on the solvent storage terrace on the south side of extraction cells 1 and 2 in a small concrete enclosure that is 3.05 meters (10 ft) wide, 10.67 meters (35 ft) long, and 3.05 meters (10 ft) high (Burn 1983). The AHA was designed and constructed in 1971-1972 as part of the NFS plant expansion project. The AHA was designed to isolate all recovered acid streams, make up various strengths of acid, and feed these acids directly to the extraction cells. The AHA was intended to reduce worker exposure to radioactively-contaminated acid. The construction of the AHA was never completed and it was never put in operation.

Based upon this evaluation, no further investigation of the AHA is proposed as the cell has never been used the fuel reprocessing operations at the site. The room is empty and is not used for waste management. No further action is proposed for the acid handling area.

3.8 Liquid Waste Cell

The liquid waste cell (LWC) is an L-shaped room of reinforced concrete construction located north of extraction cells 1 and 2 (XC-1 and XC-2) and east of the chemical process cell (CPC). (See Fig. 3.) The LWC contains nine liquid waste collection tanks with a total storage capacity of approximately 106,700 liters (28,000 gal). Five of the tanks are currently being used to store liquid waste.

3.8.1 Cell Description and Control Features

The north-south leg of the LWC is 14.10 meters (46.25 ft) long by 5.18 meters (17 ft) wide, and the east-west leg is 5.79 meters (19 ft) long by 4.80 meters (15.75 ft) wide (Burn 1983). The LWC is 5.94 meters (19.5 ft) high across its extent. The floor of the LWC is below grade at a plant elevation of 28 meters (92 ft).

The floor is 0.91 meters (3 ft) thick and is covered with 304L stainless steel that extends 0.46 meters (1.5 ft) up the walls. The stainless steel-lined portion of the LWC provides approximately 46,000 liters (12,125 gal) of secondary containment. The remainder of the cell walls are carboline-coated concrete.

The floor drains to a stainless steel-lined sump. The sump is equipped with a level indicator, a high-level alarm, and steam eductor 15H-6. Liquids in the sump are transferred by eductor 15H-6 to the hold side of the first uranium cycle waste tank 4D-10 located in the LWC (Riethmiller 1981).

The west wall of the LWC, which is shared with the CPC, is 1.75 meters (5.75 ft) thick. The south, east, and north walls range from 0.69 to 0.91 meters (2.25 to 3 ft) in thickness except for a portion of the north wall, which is shared with XC-1 and is 1.52 meters (5 ft) thick. The ceiling is 0.91 meters (3 ft) thick except over the junction of the two legs of the cell where the ceiling is 1.07 meters (3.5 ft) thick.

The LWC may be entered from the cell access aisle through a doorway on the southeast wall of the LWC. (See Fig. 3.)

There are no underground drain lines beneath the LWC. There are approximately 195 penetrations of the walls and ceiling through which small-diameter piping connects the LWC tanks with plant utilities. There are ninety-three penetrations of the ceiling for 0.30- to 7.5-centimeter (0.125- to 3-in) diameter piping used to convey cooling water, utility and instrument air, steam, and decontamination solutions to and from the chemical operating aisle (COA). The north wall has six penetrations for 2.5- to 10-centimeter (1- to 4-in) diameter piping used to convey sump liquid out of the LWC.

The east wall has eleven penetrations for 2.5- to 5-centimeter (1- to 2-in) diameter pipes that convey waste and electrical service to and from the ram equipment room, the ventilation wash room, and the analytical cell. The south wall has twenty-seven penetrations for 1.25- to 7.5-centimeter (0.5- to 3-in) diameter piping that was used to transfer aqueous waste from XC-1, XC-2, and the off-gas cell. The west wall has fifty-eight penetrations for 0.60- to 7.6- centimeter (0.25- to 3-in) diameter piping used to convey process waste streams, nitric acid, steam, and air to and from the chemical process cell, the chemical operating aisle (COA), the hot acid cell, the mechanical operating aisle (MOA), and the off-gas cell.

The LWC is ventilated by the main ventilation distribution system and receives airflow from the east mechanical operating aisle via the cell access aisle. During reprocessing, air was discharged from the LWC to the ventilation wash room washer, which is currently out-of-service. Air discharge currently bypasses the ventilation wash room washer to the main ventilation exhaust plenum, where it passes through a filter train of thirty roughing filters and thirty HEPA filters before being discharged through the main stack.

3.8.2 Historical Operations and Decontamination Activities

The nine waste collection tanks in the LWC (Table 10) were used to receive radioactive solutions from the extraction cells, the CPC, and the hot analytical cells. (See Fig. 3.) A significant amount of piping that conveys plant utilities to the LWC is present within the cell.

With the exception of tank 7D-14, which is constructed of Hastelloy C, the equipment, piping, and tanks are constructed of 304L stainless steel.

The rework evaporator feed tank (7D-8) and the plutonium cycle waste tank (4D-8) are isolated from the other tanks in a walled-off area in the southwest corner of the cell. Entry to this area is through a 0.69-meter x 1.30-meter (2.25-ft x 4.25-ft) opening in the southeast corner of the walled area.

3.8.2.1 Historical Operations

The LWC contains nine liquid waste storage tanks, five of which are currently still in use.

a) Condensate Catch Tank/Sample Collection Tank (3D-2)

The condensate catch tank (3D-2) is a vertical stainless steel tank with a storage capacity of 3,785 liters (1,000 gal) (Nuclear Fuel Services 1973). Tank 3D-2 is equipped with a level recorder and temperature indicator. Tank 3D-2 is currently in use.

During reprocessing, tank 3D-2 was used to store a dilute nitric acid condensate that was transferred from the feed adjustment and accountability tank condenser (3E-1) located in the CPC.

The sheared nuclear fuel produced in the PMC was dissolved with concentrated nitric acid in one of two dissolvers (3C-1 and 3C-2) that were located in the CPC. When dissolution was complete, the solution was transferred from the dissolver by a steam jet to the feed adjustment and accountability tank (3D-1) located in the CPC. Tank 3D-1 was vented through 3E-1 to the vessel off-gas system. The condensate in 3E-1 was a dilute nitric acid (0.1 M) that drained to 3D-2 for storage. The dilute nitric acid in 3D-2 was later used to rinse the fuel hulls in the dissolvers after the dissolver solution had been transferred to the feed adjustment and accountability tank (3D-1).

Tank 3D-2 is currently still being used and is now called the sample collection tank. It is used as a sampling point for liquids stored in LWC tank 7D-2, the low-level waste collection tank. A volume of liquid from 7D-2 is transferred to 3D-2 via a steam eductor, sampled, and analyzed for radioactivity. After sampling, the liquid in 3D-2 is transferred back to 7D-2. Sodium hydroxide is added to 3D-2 and then transferred to 7D-2 to neutralize the contents of 7D-2.

b) Plutonium Cycle Waste Catch/Hold Tank (4D-8)

The plutonium cycle waste catch/hold tank (4D-8) is a vertical bicylindrical stainless steel tank with a total storage capacity of 4,540 liters (1,200 gal) (Nuclear Fuel Services 1973). The tank is divided into a catch tank and a hold tank with each tank having a capacity of 2,270 liters (600 gal). Both the catch and hold tanks are equipped with a level recorder, density recorder, and a temperature indicator. Tank 4D-8 is no longer in use.

During fuel reprocessing the catch tank received an aqueous waste stream containing fission products, HNO_3, uranium, plutonium, and possibly small concentrations of dissolved TBP/n-dodecane from the plutonium cycle extraction column (4C-7) via 4Y-7, the 4C-7 aqueous decanter. Both 4C-7 and 4Y-7 are located in XC-2.

When the catch tank was full, the aqueous solution was transferred by steam eductors (4H-55 and 4H-54) to the hold tank where it was mixed and sampled to determine its plutonium concentration. If an economical concentration of plutonium was present the solution was transferred by steam eductor 4H-53 to the rework evaporator feed tank (7D-8) in the LWC. Otherwise, the solution was transferred by steam eductors (4H-51 and 4H-52) to the low-level waste evaporator feed tank (7D-2) in the LWC. The solution was then transferred to the low-level waste evaporator in the CPC.

Tank 4D-8 also received the decontamination solutions used to flush the partition and plutonium cycle vessels (section 3.6.2.2.2) in XC-2.

c) First Uranium Cycle Waste Catch/Hold Tank (4D-10)

The first uranium cycle waste catch tank (4D-10) is a vertical bicylindrical stainless steel tank with a total storage capacity of 22,710 liters (6,000 gal) (Nuclear Fuel Services 1973). Tank 4D-10 is divided into a catch tank and a hold tank with each tank having a capacity of 11,355 liters (3,000 gal). Both the catch and hold tanks are equipped with a level recorder, density recorder, and a temperature indicator. The 4D-10 hold tank is still currently being used.

During fuel reprocessing the catch tank received an aqueous waste stream containing fission products, HNO_3, uranium, plutonium, and possibly small concentrations of dissolved TBP/n-dodecane from the first uranium cycle extraction column (4C-9) via 4Y-9, the 4C-9 aqueous decanter, both of which located in XC-2. When the catch tank was full, the aqueous solution was transferred by steam eductors (4H-45 and 4H-46) to the hold tank where it was mixed and sampled to determine its uranium concentration.

If an economical concentration of uranium was present, the solution was transferred by steam eductor 4H-44 to the rework evaporator feed tank (7D-8) in the LWC. Otherwise, the solution was transferred by eductor (4H-42 and 4H-43) to the low-level waste evaporator feed tank (7D-2) in the LWC. The solution was then transferred to the low-level waste evaporator in the CPC. The hold side of 4D-10 also received liquid from the GPC sump, which was transferred by eductors 2H-1 and 2H-2.

The hold side of 4D-10 is still being used as a collection tank for liquids transferred by steam eductors from the GPC and LWC sumps. This liquid is transferred to 7D-2 in the LWC.

Tank 4D-10 also received some type of decontamination solutions used to flush the first uranium cycle vessels in XC-2. (See Section 3.6.2.2.2.)

d) Second Uranium Cycle Waste Catch/Hold Tank (4D-13)

The second uranium cycle waste catch/hold tank (4D-13) is a vertical bicylindrical stainless steel tank with a total storage capacity of 22,710 liters (6,000 gal) (Nuclear Fuel Services 1973). Tank 4D-13 is divided into a catch tank and a hold tank with each tank having a capacity of 11,355 liters (3,000 gal). Both the catch and hold tanks are equipped with a level recorder, density recorder, and a temperature indicator. Tank 4D-13 is no longer in use.

During fuel reprocessing the catch tank received an aqueous waste stream containing fission products, HNO_3, uranium, plutonium, and possibly small concentrations of dissolved TBP/n-dodecane from the second uranium cycle extraction column (4C-11) via 4Y-11, the 4C-11 aqueous decanter, both of which are located in XC-3.

When the catch tank was full, the aqueous solution was transferred by eductor (4H-45 and 4H-46) to the hold tank where it was mixed and sampled to determine its uranium concentration. If an economical concentration of uranium was present the solution was transferred by eductor (4H-44) to the rework evaporator feed tank (7D-8) in the LWC. Otherwise, the solution was transferred by eductor (4H-42 and 4H-43) to the low-level waste evaporator feed tank (7D-2) in the LWC and then to the low-level waste evaporator in the CPC.

Tank 4D-13 also received some of the decontamination solutions flushed through the first uranium cycle vessels in XC-2. (See Section 3.6.2.2.2.)

e) Low-level Waste Evaporator Feed Tank/Low-level Waste Collection Tank (7D-2)

The low-level waste evaporator feed tank (7D-2) is a horizontal stainless steel tank with a storage capacity of 32,200 liters (8,500 gal) (Nuclear Fuel Services 1973). Tank 7D-2 is equipped with a level recorder, density indicator, a low-level alarm, and a low-density alarm. Tank 7D-2 is currently in use.

During reprocessing tank 7D-2 routinely received aqueous waste streams from the following sources (Nuclear Fuel Services 1973):

- the plutonium cycle waste catch/hold tank (4D-8)
- the first uranium cycle waste catch tank (4D-10)
- the second uranium cycle waste catch tank (4D-13)
- condensate from the high-level evaporator (7C-1) in the CPC
- condensate from the rework evaporator (7C-4) in the CPC

Nonroutine waste streams to 7D-2 during reprocessing (Nuclear Fuel Services 1973) included:

- weak acid from the condensate catch tank (3D-2) in the LWC
- spent solvent washes from the solvent waste hold tank (13D-8) in the LWC
- liquid from the soaking pit
- hot acid from tanks 7D-11 and 7D-12 in the HAC

- liquid from the off-gas cell sump
- liquid from the acid fractionator cell sump
- condensate from the vessel off-gas condensate tank 6D-3

The aqueous waste stream in 7D-2 was transferred to the low-level waste evaporator (7C-2) in the CPC where the volume was reduced before transfer to the low-level waste accountability and neutralizer tank 7D-10 in the CPC. The contents in 7D-10 were sampled for uranium and plutonium content, neutralized with sodium hydroxide, and then pumped to tank 8D-2 in the waste tank farm for storage.

Tank 7D-2 is currently still in use and receives liquid waste from liquid waste cell tanks 3D-2, 13D-8, 7D-14, and 4D-10H as described in this section. Other sources to 7D-2 include:

- low-level radioactive water from the general purpose cell crane room (GCR) sump
- condensate from tank 6D-3, the vessel off-gas condensate catch tank, located in the off-gas cell
- spent scrubber solution from 6C-3, the vessel off-gas scrubber, located in the off-gas cell
- low-level radioactive water from tank 35104 in the GCR extension.

The contents of 7D-2 are discharged to tank 8D-2 in the high-level waste tank farm.

f) Rework Evaporator Feed Tank (7D-8)

The rework evaporator feed tank (7D-8) is a vertical stainless steel tank with a storage capacity of 11,355 liters (3,000 gal) (Nuclear Fuel Services 1973). Tank 7D-8 was equipped with a level recorder, density indicator, temperature indicator, high-level alarm, and low-level alarm. Tank 7D-8 is no longer in operation.

Aqueous process waste that contained uranium and plutonium concentrations that could be economically recovered were transferred to the rework evaporator feed tank (7D-8) instead of the waste evaporation system. During reprocessing, tank 7D-8 received aqueous waste streams from the following sources:

- partition cycle waste tank (4D-2)
- first uranium cycle waste catch tank (4D-10)
- second uranium cycle waste catch tank (4D-13)
- first plutonium cycle waste catch/hold tank (4D-8)
- solvent wash wastes from 13D-8
- vessel off-gas condensate from catch tank 6D-3

The aqueous waste streams would be transferred by steam jet from 7D-8 to the rework evaporator (7C-4) in the CPC. The aqueous stream would be concentrated in the rework evaporator and then transferred, along with the evaporator bottoms, to the input accountability and feed adjustment tank (3D-1) and then to the partition cycle feed tank (4D-1), both located in XC-1.

g) Hot Analytical Cell Drain Catch Tank (7D-14)

The hot analytical cell drain catch tank (7D-14) is a vertical 1,890-liter (500-gal) storage tank composed of Hastelloy C, a nickel alloy composed of 50% nickel, 20% chromium, 13% molybdenum, and 6% iron (American Society of Materials International 1990). Tank 7D-14 is equipped with a level indicator and a high-level alarm.

Waste from the hot analytical cell drains drained into tank 7D-14 during reprocessing operations and was transferred by eductor 7H-18 to tank 7D-2 in the LWC.

Tank 7D-14 is currently used to receive waste solutions from the hot analytical cell drains. The source of these waste solutions include (Klanian 1992):

- Neutralized fuming nitric acid waste from Sr^{90} method ACM-3001

- Unused samples from tank 8D-2, including samples from related processes such as the cement solidification system, supernatant treatment system, liquid waste treatment system, and the waste tank farm area

- Expired or unused radionuclide standards solution with an adjusted pH of 3-11

- Neutralized nitric acid rinses (filters, glassware)

- Water rinses (containers, glassware).

The liquid in tank 8D-2 has been identified as a characteristic waste with the following waste codes: barium (D005), cadmium (D006), chromium (D007), mercury (D009), and selenium (D010). It is not known whether the contents of 7D-14 are a characteristic waste because the 8D-2 samples are commingled with other waste streams listed above. If liquid levels in 7D-14 are less than 50% capacity, the waste solutions are flushed down the hot analytical cell drains with water, which may further dilute any characteristic. The liquid in 7D-14 is transferred to tank 7D-2 in the LWC.

h) Solvent Waste Catch Tank (13D-7)

The solvent waste catch tank (13D-7) is a vertical stainless steel tank with a storage capacity of 3,785 liters (1,000 gal). Tank 13D-7 is equipped with a level and density recorder. During reprocessing, tank 13D-7 received the spent sodium carbonate and dilute nitric acid wash solutions that were used in the solvent cleanup system. Tank 13D-7 is no longer in operation.

The TBP/n-dodecane solvent solution used in each of the five solvent extraction cycles was cleaned in either XC-2 or XC-3 after each use. Spent solvent entered the bottom of the carbonate wash columns (13C-1, 13C-2, 13C-3) and was mixed with a 0.2M sodium carbonate (Na_2CO_3) solution that was added to the top of the columns (Table 8). The solvent would exit the top of the column and flow into the two-stage solvent washer tanks (13D-1, 13D-2, 13D-3). The solvent underwent a two-stage wash cycle using a 0.2M sodium carbonate (Na_2CO_3) solution in these tanks. The solvent would exit the top of the solvent washer tanks and flow into the bottom of the acid wash columns (13C-4, 13C-5, 13C-6) where it was mixed with dilute 0.1M HNO_3. The solvent would exit the top of the acid wash columns and flow to the solvent storage tanks (13D-4, 13D-5, 13D-6).

The sodium carbonate and nitric acid washes used in the solvent cleanup were collected in 13D-7 and then transferred by eductor (13H-1 and 13H-2) to the solvent waste hold tank (13D-8).

Tank 13D-7 received the following decontamination solutions used to flush the solvent washers and solvent storage tanks in XC-2 and XC-3.

1) Water: 120,000 liters
2) Type 1 solution: 20,000 liters
3) Type 2 solution: 20,000 liters
4) Sodium tartrate solution: 9,000 liters

i) Solvent Waste Hold Tank (13D-8)

The solvent waste hold tank (13D-8) is a vertical stainless steel tank with a storage capacity of 3,785 liters (1,000 gal). Tank 13D-8 is equipped with a level recorder, density recorder, and a high-level alarm.

During reprocessing, tank 13D-8 received the spent sodium carbonate solution and nitric acid washes that were collected in the solvent waste catch tank (13D-7). Tank 13D-8 also received liquids transferred by eductor from the sumps in XC-2 (15H-10), XC-3 (15H-11), and the product purification cell (15H-8).

After sampling, the contents of 13D-8 were transferred by eductor to one of three tanks. If the concentration of uranium and plutonium was economical to reprocess, the solution was transferred by eductor (13H-5) to the rework evaporator feed tank (7D-8) in the LWC. If the contents of 13D-8 were determined to be a low-level waste stream, it was transferred by eductor (13H-3) to tank 7D-2 in the LWC. If the liquid was characterized as an intermediate-level waste stream, the contents were transferred by eductor (13H-4) to the general purpose evaporator (7C-5) in the acid recovery cell.

Tank 13D-8 is still in use and receives any liquid that may accumulate in the sumps in XC-2, XC-3, the product purification cell (PPC), and the off-gas cell Chemical data for the sump liquid is unavailable. However, since XC-3 and the PPC currently manage tank 8D-2 supernatant that is characteristic for chromium input from these sumps is expected to be a characteristic waste. The contents of 13D-8 are now transferred by eductor (13H-3) to 7D-2. The contents of 7D-2 are discharged to tank 8D-2 in the high-level waste tank farm.

3.8.2.2 Decontamination and Decommissioning Activities

A specific decontamination effort was not performed in the LWC nor for any of the tanks and piping in the LWC. The tanks and piping were indirectly decontaminated during the decontamination of vessels in XC-1, XC-2, and XC-3.

3.8.3 Current Conditions

The last entry into the LWC was in the early 1970s, and a detailed description of the physical condition of the cell is unavailable.

An exploratory radiation survey was performed in the LWC in late 1982 (Smokowski 1983). Three 20-centimeter (8-in) diameter holes were drilled through the ceiling of the LWC from the overlying chemical operating aisle. Radiation levels in the LWC were measured by lowering thermoluminescent dosimetry badges and an ion chamber connected to a dose rate meter through the holes and into the cell. The dose rate calculated by both methods ranged from 0.105 R/hr to 3.62 R/hr. Smear samples of the floor indicated upwards of 836,000 dpm smearable beta contamination and 12,500 dpm smearable alpha contamination. A gamma scan and beta survey indicated that Cs-137, Sr-90, and daughter products were the major components of beta activity on the floor.

3.8.4 Conclusions: Potential for Release

The tanks and piping in the LWC received various aqueous waste streams from the CPC, XC-1, XC-2, XC-3, and the hot analytical cells during reprocessing. Five of the tanks are currently in use supporting present day operations. Samples of RCRA characteristic waste have been sent to and managed in tank 7D-14. This waste is from tank 8D-2 and related processes and exhibits the following RCRA waste codes: barium (D005), cadmium (D006), chromium (D007), mercury (D009), and selenium (D010). Since the 8D-2 waste is commingled with other nonhazardous waste streams entering 7D-14 it is unknown whether the material in 7D-14 retains its hazardous characteristic. The contents of 7D-14 are transferred in sequence to tank 7D-2, tank 3D-2 for sampling, and to 8D-2 for management.

Residual material that contributes to the measured dose rate in the cell may still be present in the remaining tanks and on the floor of the LWC. It is not known whether this material exhibits a RCRA characteristic since it has not been sampled and analyzed. Regardless of its classification, this material is contained and confined within stainless steel tanks and piping, and in the unlikely event of any material being released it would be contained by the cell's welded stainless steel liner that provides approximately 46,000 liters (12,125 gal) of spill containment.

There are no known releases of any material from the LWC to the environment. Releases to the underlying sand and gravel are considered unlikely since the cell is lined with a welded stainless steel liner and the concrete floor is 0.91 meters (3 ft) thick. There were no reported catastrophic releases from the equipment during operations that would have exceeded the containment capacity of the liner. The stainless steel liner would have provided more than enough secondary containment to contain a complete release of contents from any of the tanks in the LWC. Any leaks in the cell are expected to have collected in the LWC sump and would have been transferred to tank 4D-10. All of the tanks were equipped with level indicators and several with low-level alarms. All piping to the tanks was aboveground within the cell. The LWC is ventilated by the main ventilation system, passing through a filtration system with roughing filters and HEPA filters before being discharged through the main stack. During reprocessing the air discharged from the LWC would also have passed through the ventilation wash room washer. No further action is proposed for the liquid waste cell.

3.9 Acid Recovery Cell

The acid recovery cell (ARC) is located in the southwest corner of the process building at a plant elevation of 33.98 meters (111.5 feet) (Fig. 13). During reprocessing, the acid recovery cell was used to recover and concentrate dilute nitric acid for reuse in fuel reprocessing.

3.9.1 Cell Description and Control Features

The acid recovery cell is of concrete construction and is 8.76 meters (28.75 ft) wide, 9.30 meters (30.5 ft) long, and 8.08 meters (26.5 ft) high (Riethmiller 1981). A 3.43 meter x 3.20 meter (11.25 ft x 10.5 ft) section that houses the upper portion of the acid fractionator (7C-3) extends to an elevation of 43.58 meters (143 ft). The west and south walls are constructed of 0.30 meter (1 ft) thick filled block. The north wall is shared with the off-gas cell and is 0.61 meters (2 ft) thick. The east wall is shared with XC-1 and the acid recovery stairwell. These walls are 1.52 meters (5 ft) and 0.30 meters (1 ft) thick, respectively.

The concrete floor and ceiling are 0.46 meters (1.5 ft) thick. A 0.30 meter (1 ft) diameter sump is located in the floor on the east side of the cell. The depth of the sump is unknown but is less than the floor thickness of 0.46 meters (1.5 ft). The sump received liquids spilled in the ARC and from the overlying off-gas/acid recovery operating aisle. The contents of the sump was transferred by eductor 15H-4 to the general purpose evaporator (7C-5) in the acid recovery cell. The sump was equipped with a level indicator and a high-level alarm.

The ARC was accessible at the following locations:

- a door on the east side of the cell that connects with the acid recovery stairway at a plant elevation of 33.98 meters (111.5 ft).

- a man-way on the north side of the ARC that connects with the off-gas cell.

- a 1.07 meter (3.5 ft) diameter hatch in the ceiling that connects with the overlying off-gas/acid recovery aisle.

The ARC is ventilated by the main ventilation distribution system and receives its airflow from the acid recovery stairway, acid recovery pump room, and the off-gas blower room. Air discharges from the ARC to the off-gas cell and then to the main ventilation plenum where it passes through roughing and HEPA filters before being discharged through the main stack.

3.9.2 Historical Operations and Decontamination Activities

3.9.2.1 Historical Operations

The acid recovery cell was part of the acid recovery system that recovered much of the nitric acid used to dissolve the spent nuclear fuel. The acid was recovered principally by evaporation and fractionation of the aqueous waste streams generated in the solvent extraction process. The original equipment in the acid recovery cell is listed in Table 10. All of the equipment was constructed of 304L stainless steel and was operated remotely.

The process building operated a high-level evaporation system for the partition cycle aqueous waste stream and a low-level evaporation system for treating condensate from the high-level system and the aqueous waste streams from the solvent extraction processes other than the partition cycle. The condensate from these systems was processed through the acid recovery system to recover the nitric acid for reuse.

Condensate from the high-level waste evaporator and the rework evaporator, aqueous waste from the solvent extraction operations other than the partition cycle, and the aqueous solvent washes were collected in the low-level waste evaporator feed tank (7D-2) in the liquid waste cell (LWC). This liquid was transferred to the low-level waste evaporator 7C-2 in the chemical process cell.

The condensate from 7C-2 was transferred to the acid fractionator feed tank (7D-3) in the acid recovery cell and then to the acid fractionator feed vaporizer (7E-1) (Table 10). The vaporizer bottoms, a 7-12M nitric acid, was pumped to the hot acid storage tank (7D-11) or the hot acid batch tank (7D-12) in the hot acid cell by the vaporizer bottoms pump (7G-10) in the acid recovery pump room. The acid in these tanks was pumped to the dissolvers in the chemical process cell.

The vapors from the vaporizer were sent to the acid fractionator (7C-3) in the acid recovery cell. The fractionator bottoms were pumped to the recovered acid storage tank (7D-5) on the solvent storage terrace by the fractionator bottoms pump (7G-5) located in the acid recovery pump room. The fractionator condensate, a weak (0.01M) nitric acid, was sent to the weak acid catch tank (7D-6) in the acid recovery pump room where it was either reintroduced into 7C-3 or discharged to the interceptor.

The ARC equipment was known to leak during reprocessing. In 1967 a spill that contaminated the floor of the ARC required six inches of concrete to be poured over the floor for shielding (West Valley Nuclear Services Co., Inc. July 29, 1993). The volume of acid spilled and the data of the spill is unknown.

3.9.2.2 Decontamination and Decommissioning Activities

Prior to the start of decontamination, all of the recovered acid in the system was transferred to the high-level waste tank 8D-2 via the low-level waste accountability and neutralizer tank (7D-10) in the chemical process cell.

The following equipment in the ARC was decontaminated between June 4, 1972 and May 8, 1973 (Riethmiller 1981):

- Acid fractionator feed tank (7D-3)
- Acid fractionator feed vaporizer (7E-1)
- Acid fractionator (7C-3)

This equipment was flushed with 200 liters of 18M sodium hydroxide and an unknown volume of water during this period. These solutions were transferred to the low-level waste accountability and neutralizer tank (7D-10) in the chemical process cell.

A general cleanup of the ARC was conducted between October 13, 1972 and November 22, 1972 (Riethmiller 1981). Thirty-five drums containing assorted debris such as concrete blocks, lead sheets, cut piping, and ladders were removed from the ARC during the cleanup.

3.9.3 Current Conditions

All vessels except the general purpose evaporator (7C-5) were reported as empty in 1981 (Riethmiller 1981). The liquid in 7C-5 was believed to be water that originated from the off-gas aisle via the ARC sump. The ARC was last entered in 1984 for a radiation survey that indicated radiation levels of a few mR/hr in the cell (West Valley Nuclear Services Co. Inc. July 29, 1993).

3.9.4 Conclusions: Potential for Release

Based on this review, there are no indications that RCRA-listed hazardous waste or hazardous constituents are managed in the ARC. All acid remaining in the vessels in the ARC was transferred to tank 8D-2 for management prior to the start of decontamination activities in 1972. The vessels were flushed with sodium hydroxide and water during decontamination and the waste solutions were eventually transferred to tank 8D-2 for management. All vessels except 7C-5 were reported as empty in 1981. The level indicator for 7C-5 indicates it is currently 40% full. The contents are assumed to be water from the ARC sump.

Although the ARC equipment was known to leak during reprocessing (West Valley Nuclear Services Co., Inc. July 29, 1993), there are no known releases of any material from the ARC to the environment. No further action is proposed for the acid recovery cell.

3.10 Acid Recovery Pump Room

The acid recovery pump room (ARPR) is located adjacent to the off-gas blower room in the southwest corner of the process building at a plant elevation of 30.48 meters (100 ft) (Fig. 3). The ARPR housed pumps that transferred acid streams from the acid recovery cell to various storage vessels in the plant.

3.10.1 Cell Description and Control Features

The ARPR was constructed of reinforced concrete and is 4.88 meters (16 ft) wide, 6.96 meters (22.83 ft) long, and 3.05 meters (10 ft) high (Burn 1983). The walls and floor are 0.30 meters (1 ft) thick and the ceiling is 0.46 meters (1.5 ft) thick. The floors, walls, and ceiling were coated with carboline-base paint. A floor drain in the center of the cell drains to the interceptor.

A pump niche containing the vaporizer bottoms pump (7G-10), which measures 0.90 meters (3 ft) on a side, is located in the northeast corner of the cell. The niche drains to the scrubber recirculation pump niche in the OGBR, which drains to the off-gas cell sump.

The cell was accessible through a door in the east wall of the cell that connected to acid recovery stairway. The door was sealed on May 6, 1976 with a plywood cover with its edges caulked over.

The ARPR is ventilated by the main ventilation distribution system and receives its airflow from the control room via the acid recovery stairway. Air is discharged in sequence to the acid recovery cell, off-gas cell, and to the main ventilation plenum, where it passes through roughing and HEPA filters before being discharged through the main stack.

3.10.2 Historical Operations and Decontamination Activities

3.10.2.1 Historical Operations

The acid recovery pump room (ARPR) contained the weak acid catch tank (7D-6) and several pumps that were used to transfer decontaminated and high-activity nitric acid streams from the acid recovery cell to various storage vessels in the process building. The original equipment in the ARPR is listed in Table 11.

The fractionator bottoms pump (7G-5) transferred a nitric acid that was derived from the bottoms of the acid fractionator (7C-3) to the recovered acid storage tank (7D-5) on the solvent storage terrace. The vaporizer bottoms pump (7G-10) was used to pump a 7-12M nitric acid that was derived from the bottoms of the acid fractionator feed vaporizer (7E-1) to the hot acid storage tank (7D-11) in the hot acid cell. The weak acid pump (7G-1) transferred weak (0.01M) nitric acid from the weak acid catch tank (7D-6) to either the acid fractionator (7C-3), the interceptor, or the hot acid batch tank (7D-12) in the hot acid cell.

Equipment in the ARPR reportedly leaked acid during reprocessing and eroded parts of the concrete walls and floor. The volume of acid spilled and the dates the spills occurred is unknown. However, in early 1967 a spill is reported to have occurred in the ARPR from a discharge line from the general purpose evaporator (7C-5) to tank 8D-2 in the waste tank farm (Lewis May 16, 1967). This material drained to the floor drain and then to the interceptor. On another occasion in early 1967, an underground process line (7P-160) near the ARPR reportedly failed underground in early 1967 (Lewis May 16, 1967). This line conveyed radioactively contaminated liquid from the laundry drain tank (7D-13) to either the general purpose evaporator (7C-5) or the interceptor depending on the activity of the liquid.

The ARPR is no longer used for any operations and is only used to store three spent vessel off-gas HEPA filters.

3.10.2.2 Decontamination and Decommissioning Activities

Decontamination work was performed in the ARPR between April 28, 1972 and May 6, 1976 (Riethmiller 1981). Initially, miscellaneous trash, loose concrete, equipment, and lead used for shielding was removed from the room. Loose concrete was removed from the floor on at least three occasions. Releases of acid from the acid recovery system apparently eroded the floor of the ARPR. Such a release occurred in early 1967 when a section of discharge line from the general purpose evaporator (7C-5) to waste tank 8D-2 failed by corrosion in the ARPR (Lewis 1967).

The cell was flushed with an unknown volume of sodium tartrate solution, potassium permanganate solution, citric acid solution, Radiacwash® solution, and water rinses in 1974 and 1976 (Riethmiller 1981).

On May 1, 1976, a new drain from the OGBR and the south stairway was installed which opened into the ARPR floor drain. A concrete sill was poured at the door to the ARPR and the doorway was covered with a plywood cover and caulked over.

3.10.3 Current Conditions

The ARPR was last entered in January 1994. The walls were described as dirty and the concrete floor was in bad shape and looked like a dirt floor. However, the floor reportedly had a solid feel to it and it appeared that only the upper few inches of the floor was affected by historic acid spills. This inspection confirmed an earlier assessment that described the walls and floor as severely eroded from acid spills and leaks (Burn 1983).

The ARPR contains some debris and three spent vessel off-gas HEPA filters that were removed from the off-gas blower room during filter changes. A paper characterization of the spent filters was completed using the air permit conditions, contributing sources of pollutants and estimated time in-service. Based on this analysis the filters are RCRA non-hazardous and the filters have been scheduled to be sampled for radiological characterization.

3.10.4 Conclusions: Potential for Release

Based on this review, there are no indications that RCRA-listed hazardous waste is managed in the ARPR. The paper characterization for the air filters indicates that they are RCRA non-hazardous waste. Dispostion will be based on the results of the radiological characterization. There is at least one known instance where radioactive material was released to the environment near the ARPR, when process line 7P-160 reportedly failed underground in early 1967 (Lewis, May 16, 1967). From piping diagrams it appears that this line was subsequently taken out of service. The spent filters are scheduled for confirmatory sampling and removal to on-site waste storage. No other further action is proposed for the acid recovery pump room.

3.11 Hot Acid Cell

The hot acid cell (HAC) is located on top of the CPC at a plant elevation of 45.11 meters (148 ft) (Fig. 14). The HAC contains two storage tanks that were used to store the nitric acid used to dissolve nuclear fuel in the CPC. The HAC is not presently being used.

3.11.1 Cell Description and Control Features

The HAC is 5.26 meters (17.25 ft) wide, 6.25 meters (20.5 ft) long, and 4.57 meters (15 ft) high (Burn 1983). The 1.52-meter (5-ft) thick concrete floor of the HAC is also the ceiling of the underlying CPC. The ceiling of the HAC is composed of corrugated steel with insulation and the built-up roof above. The walls of the HAC are composed of 0.30-meter (1-ft) thick solid concrete block.

A floor drain in the cell connects to 7C-5, the general purpose evaporator located in the acid recovery cell (ARC). The HAC can be entered through a door located at the east end of the cell.

The HAC contains two horizontal stainless steel storage tanks: 7D-11, the hot acid storage tank and 7D-12, the hot acid batch tank (Table 9). These tanks were used to store and mix partially decontaminated nitric acid used to dissolve fuel during fuel reprocessing. Tank 7D-11 has a storage capacity of 12,110 liters (3,200 gal) and tank 7D-12 has a capacity of 6,800 liters (1,800 gal).

The HAC also contains a pump, 7G-3, that was used to pump the nitric acid to the dissolvers in the CPC. The pump is housed in a pump niche on the east side of the cell. The niche is 1.93 meters (6.33 ft) wide, 3.87 meters (12.75 ft) long, and 2.29 meters (7.5 ft) high, on the east side of the cell (Burn 1983). The niche has a 12.7-centimeter (5-in) thick ceiling of poured concrete.

3.11.2 Historical Operations and Decontamination Activities

The hot acid cell housed the hot acid storage tank (7D-11) and the hot acid batch tank (7D-12). These tanks received a radioactive 7-12M nitric acid produced in the bottoms of the acid recovery cells acid fractionator feed vaporizer (7E-1). During reprocessing the nitric acid in these tanks were pumped to the dissolvers in the chemical process cell.

3.11.2.2 Decontamination and Decommissioning Activities

In 1972 decontamination of the vessels and piping in the acid recovery system was initiated to reduce radiation levels so a connection to a new acid recovery facility could be completed. Before decontamination all of the recovered acid in the system was transferred via 7D-10 in the liquid waste cell to tank 8D-2, the high-level waste storage tank (Riethmiller 1981).

Tanks 7D-11 and 7D-12 were decontaminated with the following solutions between April 11 and May 31, 1972 (Riethmiller 1981):

1) Water: 48,000 liters
2) 1/2 strength Type 1 solution: 7,000 liters
3) Type 2 solution: 4,000 liters

The composition of the decontamination solutions are reported in Section 3.5.2.2.2.

The waste decontamination solutions were transferred to either the low-level waste evaporator feed tank (7D-2) in XC-1, the general purpose evaporator (7C-5) in the acid recovery cell, the waste neutralizer accountability tank (7D-10) in the liquid waste cell, or, when the activity of the solution permitted, to the interceptor (Riethmiller 1981).

3.11.3 Current Conditions

The first entry into the HAC since the early 1970s was on February 14, 1994. The cell is in good condition and does not contain any loose debris. The tanks, piping, and walls appeared to be in good condition. The painted concrete floor was covered with approximately 6.35 millimeters (0.25 in) of dust. The concrete floor was pitted in places but loose chips were not observed. Radiation levels of 5 mR/hr to 10 mR/hr are present near the floor and are 10 mR/hr to 15 mR/hr at the base of the tanks. Residue within the tanks is believed to be the source of the radiation as tanks 7D-11 and 7D-12 were reported to be empty (Riethmiller 1981). Total radioactivity in the HAC is estimated to be 0.61 Ci (West Valley Nuclear Services 1993).

3.11.4 Conclusions: Potential for Release

Based on this review there are no indications that RCRA-listed hazardous waste or hazardous constituents were managed in the HAC. The nitric acid in the HAC was recovered through evaporation and fractionation of the aqueous waste streams generated in the solvent extraction process. The acid in tanks 7D-11 and 7D-12 was emptied to tank 8D-2 before they were decontaminated in 1972. The decontamination solutions were transferred to the low-level waste evaporator feed tank, general purpose evaporator, waste neutralizer accountability tank, or the interceptor.

There may be residual material such as scale remaining in the tanks that is the source of the elevated radiation levels that were measured underneath the tanks. This material is contained within stainless steel tanks and piping and in the unlikely event of a release, it would be contained on the 1.52-meter (5-ft) thick concrete floor of the cell.

There are no known releases of any material from the HAC to the environment. Any releases of acid during reprocessing would have drained to the cell floor drain and to the general purpose evaporator (7C-5) in the acid recovery cell. Releases to the sand and gravel unit underlying the process building are unlikely since any released acid that did not drain to 7C-5 would have had to migrate through the 1.52-meter (5-ft) thick concrete floor to the cell and through two underlying floors of the process building to reach the sand and gravel. No further action is proposed for the hot acid cell.

3.12 Off-gas Cell

The off-gas cell (OGC) is located adjacent to the off-gas blower room in the southwest corner of the process building at a plant elevation of 30.48 meters (100 ft) (Fig. 3). The OGC contains the equipment for the process buildings vessel off-gas (VOG) and dissolver off-gas (DOG) systems.

3.12.1 Cell Description and Control Features

The OGC was constructed of reinforced concrete and is 3.66 meters (12 ft) wide, 9.30 meters (30.5 ft) long, and 8.83 meters (29 ft) high (Burn 1983). The north and east walls are 1.52 meters (5 ft) thick, the west wall is 0.90 meters thick (3 ft), and the south wall is 0.61 meters (2 ft) thick. The ceiling is 0.46 meters (1.5 ft) thick and the floor is 0.30 meters (1 ft) thick. The floors, walls, and ceiling are coated with carboline-base paint.

The floor is equipped with two sumps that are emptied by eductors 15H-7 and 15H-12 to the solvent waste hold tank (13D-8) in the liquid waste cell. Both sumps are equipped with level indicators and high-level alarms.

The OGC is serviced by the main ventilation distribution system and receives its airflow from the acid recovery stairway via the acid recovery cell. Air discharges from the OGC to the main ventilation plenum, where it passes through roughing and HEPA filters before being discharged through the main stack.

3.12.2 Historical Operations and Decontamination Activities

The OGC housed the equipment for the process building's dissolver off-gas (DOG) and vessel off-gas (VOG) systems. The DOG system has been inoperative since November 1975. The VOG system is still being used to ventilate gases from vessels and tanks in the process building. The original equipment installed in the OGC is listed in Table 13. All of the equipment was fabricated of 304L stainless steel.

3.12.2.1 Historical Operations

The dissolver off-gas system (DOG) was designed to ventilate gases from the dissolvers in the chemical process cell and the fuel bundle shear in the process mechanical cell. The gas and air streams from these sources were ducted to the DOG scrubber where it was scrubbed with a water and caustic solution. The scrubber solution was recirculated by the DOG scrubber recirculation pump located in the off-gas blower room pump niche.

During reprocessing from 1966 to mid-1967 a 0.01M mercurous or mercuric nitrate solution was added to the dissolver off-gas scrubber (6C-6) to remove iodine-131 from the dissolver off-gas (Duckworth 1982). The solution was regenerated by transferring about 300 liters of 6C-6 bottoms into each 1-ton dissolver batch and replacing the transferred volume with fresh 0.01 M solution. In mid-1967 the solution concentration was reduced to 0.0001M since it was apparent that I-131 with its short half-life of 8.1 days was not present in significant quantities in the spent fuel. No records exist concerning the volume of mercurous/mercuric nitrate solution used during reprocessing. An estimated 90.9 kilograms (200 lbs) of mercury was added to 6C-6 during reprocessing (Duckworth 1982).

The scrubbed air would exit the top of the DOG scrubber and pass through the DOG heater and cooler before entering the DOG HEPA filters and blowers in the off-gas blower room.

The airstream was then ducted through another set of HEPA filters before being discharged through the main stack.

The vessel off-gases are ducted to the vessel off-gas condenser (6E-3). The condensate drains to the vessel off-gas condensate catch tank (6D-3) while the air effluent continues to the vessel off-gas scrubber (6C-3) where it is scrubbed with a water and caustic solution. The scrubber solution was recirculated with the VOG scrubber recirculation pump located in the off-gas blower room pump niche.

The scrubbed air would exit the top of the scrubber and pass through the VOG heater before passing through the VOG HEPA filters and blowers in the off-gas blower room. The airstream was then ducted through another set of HEPA filters before being discharged through the main stack.

3.12.2.2 Decontamination and Decommissioning Activities

The following dissolver off-gas equipment was decontaminated between July 21, 1972 and August 30, 1972 (Riethmiller 1981):

- dissolver off-gas scrubber (6C-6)
- dissolver off-gas silver reactors (6C-1 and 6C-1A)
- dissolver off-gas heater (6E-1)
- dissolver off-gas cooler (6E-2)

Decontamination solutions were added to 6C-6 until it overflowed and filled the remaining vessels in the DOG system.

The following volumes of decontamination solutions were flushed through the DOG equipment:

Water - approximately 25,700 liters
Type I decontamination solution (1/2 strength) - 3,400 liters
Type II decontamination solution - 3,400 liters

The composition of the decontamination solutions are reported in Section 3.5.2.2.2.

The waste decontamination solutions were transferred to the low-level waste evaporator feed tank (7D-2) in the liquid waste cell. Decontamination solutions that had spilled to the floor collected in the sumps and were transferred by eductor to the solvent waste hold tank (13D-8) and then to the low-level waste evaporator feed tank (7D-2) in the liquid waste cell. The water used in the last flush is reportedly still present in the DOG vessels (Riethmiller 1981).

There was no specific decontamination program implemented for the vessel off-gas equipment. The VOG equipment did receive about 6,000 liters of decontamination solutions that were used in the decontamination of vessels in other systems. Approximately 1,000 liters of water is added once a week to the vessel off-gas scrubber (6C-3) to make-up water loss by evaporation (Riethmiller 1981). The water in 6C-3 is recirculated by the vessel off-gas scrubber recirculation pump (6G-2) located in the off-gas blower room.

3.12.3 Current Conditions

The last entry into the OGC occurred on August 4, 1972 (Riethmiller 1981). Loose concrete (powder) was noticed on the walls in the northwest corner of the cell. Reported radiation levels along the floor were 20 R/hr to 25 R/hr and were as high as 50 R/hr in the northwest corner (Riethmiller 1981). The concrete floor is reported to be in poor condition from acid that leaked from an acid recovery line that passed through the cell (Burn 1983).

3.12.4 Conclusions: Potential for Release

Based on this review there are no indications that RCRA-listed hazardous waste or hazardous constituents are currently managed in the OGC. Compounds of mercury are classified as hazardous constituents and were used in the DOG scrubber during reprocessing. However, due to the small quantities used and the time transpired since its last use, none is believed to be currently present in the DOG equipment that was flushed with water and decontamination solutions in 1972. All decontamination solutions were transferred to tank 7D-2 after decontamination. The contents of 7D-2 are periodically transferred to 8D-2 for management.

There are no known releases of any material from the OGC to the environment. However, piping for the ARC in the OGC is reported to have leaked and damaged the floor of the OGC. Leaks and spills during reprocessing or potential residual material in some of the vessels may be responsible for the radiation levels in the cell. No further action is proposed for the off-gas cell.

3.13 Off-Gas Blower Room

The off-gas blower room (OGBR) is a reinforced concrete room located west of extraction cell 1 (XC-1) at a plant elevation of 30.86 meters (101.25 ft). (See Fig. 3.) The OGBR contains the blowers, filters, and scrubber recirculation pumps used in the process off-gas ventilation system.

3.13.1 Cell Description and Control Features

The OGBR is 3.58 meters (11.75 ft) wide, 9.90 meters (32.5 ft) long, and 2.90 meters (9.5 ft) high (Burn 1983). The floor, ceiling, and north wall are 0.61 meters (2 ft) thick, while the south and west walls are 0.30 meters (1 ft) thick. The east wall, which is shared with XC-1, is 1.52 meters (5 ft) thick. An entry door to the OGBR is located at the southeast corner of the room, at a plant elevation of 30.48 meters (100 ft).

A floor drain in the center of the cell connects to a sump in the adjacent off-gas cell (OGC). There are nine underground process lines beneath the OGBR that connect to the chemical process cell and are not connected with the OGBR. Seven of the lines were never used during reprocessing and were capped and covered. The other two lines connected the low-level waste accountability (7D-10) in the CPC with tanks 8D-1 and 8D-2 in the high-level waste tank farm. Tank 7D-10 was removed during the decontamination and decommissioning of the CPC in 1985-1986.

The OGBR is serviced by the main ventilation distribution system and receives its air flow from the south stairway. Air is sequentially discharged to the overlying acid recovery cell, off-gas cell, and the main ventilation exhaust plenum, where it passes through roughing and HEPA filters before being discharged through the main stack.

3.13.2 Historical Operations and Decontamination Activities

3.13.2.1 Historical Operations

The OGBR contains the blowers, filters, and scrubber recirculation pumps for the process building dissolver off-gas (DOG) and vessel off-gas (VOG) ventilation systems. The dissolver off-gas system was used to exhaust the dissolvers in the CPC through a scrubber, a silver nitrate reactor that was designed to remove iodine, and a HEPA filter before discharge through the main stack. Although the silver nitrate reactor was present in the OGC it was not used during current or previous operations. The vessel off-gas system exhausts the process building vessels through a scrubber and a HEPA filter before discharge through the main stack.

There are four process off-gas blowers, four HEPA filters, two off-gas scrubber recirculation pumps, and a 1-ton capacity monorail-mounted hoist in the OGBR.

The process off-gas blowers are mounted on the floor along the south wall of the OGBR. Two of the blowers were dedicated for dissolver off-gas service and the other two were dedicated for vessel off-gas service. Each of the blowers is connected in series to a HEPA filter housed in a 0.81-meter (2.67-ft) diameter stainless steel-lined lead and concrete niche that extends 1.22 meters (4 ft) into the floor of the OGBR. The dissolver off-gas system has been shut down since November 1975, when the dissolver off-gas blowers were removed, but the vessel off-gas system is still in operation. The vessel off-gas system has the ability to draw approximately 600 ft^3/min of air from the plant vessel vent headers and to filter out more than 99.95% of any contained particulates on a shielded HEPA filter.

The two off-gas scrubber recirculation pumps are housed in a stainless steel-lined concrete pump niche sunk into the floor of the OGBR. The niche is approximately 2.29 meters (7.5 ft) long, 1.60 meters (5.25 ft) wide, and 1.6 meters (5.25 ft) deep. The pumps are used to circulate scrubber solution through the dissolver off-gas and vessel off-gas scrubbers in the off-gas cell. The scrubber pump niche drains to the sump in the off-gas cell. All piping and valves in the OGBR are 304L stainless steel.

The 1-ton capacity hoist services the HEPA filter and the scrubber pump niche.

3.13.2.2 Decontamination and Decommissioning Activities

The OGBR was decontaminated between November 1975 and June 23, 1976 (Riethmiller 1981). The dissolver off-gas blowers, one vessel off-gas blower, and one vessel off-gas filter were removed in November. The vessel off-gas blower and filter were replaced later. Since acid leaks from the acid recovery cell had damaged the floor of the OGBR (Burn 1983) new concrete was poured in the southwest corner of the OGBR on May 6, 1976 (Riethmiller 1981). The walls, floor, and ceiling were flushed with unknown volumes of Radiacwash® solution, citric acid solution, Chem-Clean, and Organisol®.

3.13.3 Current Conditions

The floor and walls of the OGBR were reportedly badly eroded by acid leaks from the acid recovery cell (ARC), located above the off-gas blower room (Burn 1983). New concrete was poured in the southwest corner of the cell in 1976.

The off-gas blower room was entered several times during the 1980s in order to change the HEPA filters, with the latest entry in the fall of 1992 for a general clean-up of the cell (R. Lauber pers. comm. 1994). The floor is believed to be in good condition and is currently covered with sheets of plastic.

The OGBR is estimated to contain a total of 12 Ci of radiation (West Valley Nuclear Services July 29, 1993), with the majority contained in the HEPA filters.

3.13.4 Conclusions: Potential for Release

Based on this review there are no indications that RCRA-listed hazardous waste or constituents are managed in the OGBR. The only equipment presently in the OGBR are the two VOG blowers, two HEPA filters, and the scrubber recirculation pumps. Acid leaks from the acid recovery cell during reprocessing reportedly eroded the floor of the OGBR, which required new concrete to be poured in the southwest corner of the cell in 1976. Any release to the environment is considered unlikely since the concrete floor is 0.61 meters (2 ft) thick. There are no records that indicate that a catastrophic release of acid occurred from the acid recovery cell; rather, the leaks were apparently intermittent drips that damaged the upper portion of the floor. If a larger volume had been released it would have drained to the off-gas cell sump through the OGBR floor drain. Scrubber solution that may have leaked from the recirculation pumps would have drained to the sump in the OGC. Any liquid in the off-gas cell sump is transferred to tank 13D-8 in the liquid waste cell. No further action is proposed for the off-gas blower room.

3.14 Ventilation Wash Room

The ventilation wash room (VWR) is a reinforced concrete room located south of and next to the PMC on the second floor of the process building at a plant elevation of 34.90 meters (114.5 ft) (Fig. 13). The VWR overlies the ram equipment room. The VWR contains an air washer and duct work that scrubs ventilation air discharged from a number of the cells, analytical laboratories, and plant areas.

3.14.1 Cell Description and Control Features

The VWR is 6.09 meters (20.0 ft) wide, 7.59 meters (24.916 ft) long, and 4.72 meters (15.5 ft) high. The floor, ceiling, and south and east walls are 0.30 meters (1 ft) thick. The west wall is 0.61 meters (2 ft) thick and the north wall, shared with the PMC, is 1.52 meters (5 ft) thick.

A floor drain located in the east side of the VWR empties to the PMC floor drains that drain to the GPC sump. There are approximately fifty penetrations of the floor, ceiling, and east, south, and west walls that house duct work and conduits for plant utilities (Bechtel Drawing 15A-L-112). The north wall, shared with the PMC, does not have any penetrations. The VWR may be entered through a door at the southeast corner of the cell that connects with the lower extraction aisle.

3.14.2 Historical Operations and Decontamination Activities

3.14.2.1 Historical Operations

The VWR was principally designed to scrub particulates from cell exhausts before the air entered the main ventilation exhaust filter plenum. Chemical fumes from the laboratory hood exhausts were also scrubbed. The washer was mainly intended to remove particulates, especially those originating from the saw and shear in the PMC. The VWR contains a washer, pumps, filters, and a heater unit.

Air entering the washer was scrubbed in two or three stages, using recirculated water. The water was circulated by a pump located in a shielded niche outside the east wall of the VWR. After each scrubber stage the air passed through a filter stage to remove any particulates and water droplets. Heated air is added to the scrubbed air after it passes the washer to raise the airstream temperature above the dew point. The scrubbed air would discharge through a 0.91-meter (3-ft) diameter stainless steel duct and flow to the ventilation exhaust cell (VEC) plenum.

The VWR was able to process approximately 19,600 ft^3/min of contaminated exhaust air from the plant process cells, operating aisles, and chemical laboratories. The washer was able to process 14,300 ft^3/min, with the remaining airflow passing to the exhaust side of the VWR.

The washer recirculated scrub water at a rate of 500 gpm. When the washer solution reached a particular activity level it was pumped to tank 7D-2 in the LWC.

The washer is presently out-of-service because the sprayed filter pads are plugged. Air presently bypasses the washer and passes from the VWR supply plenum through a 0.66-meter (26-in) diameter duct to the main ventilation exhaust system plenum. The air washer is no longer required to meet radiological air discharge requirements since airborne radioactivity is removed by the head end ventilation system.

3.14.2.2 Decontamination and Decommissioning Activities

The VWR was not the focus of a major decontamination effort since reprocessing operations terminated. The washer may have been flushed with water.

3.14.3 Current Conditions

The VWR was last entered in the late 1980s, however, a description of its physical condition is unavailable.

The VWR is radioactively contaminated with fission product in the interior of the ducts and washer. General background radiation levels in the cell of 200 mR/hr to 1,000 mR/hr are estimated, with levels in excess of 5 R/hr at the washer (Burn 1983).

3.14.4 Conclusions: Potential for Release

Based on this review there are no indications that RCRA hazardous waste or constituents were or are managed in the VWR. Water was used to scrub particulates from ventilation air in the washer unit. The washer water was recirculated at a rate of 500 gpm by a pump located in a shielded niche outside the east wall of the VWR. When the washer water reached a set radioactivity level, it was pumped to tank 7D-2 in the liquid waste cell.

There are no known releases of any material from the VWR to the environment. Any potential releases of washer water would have entered the floor drains and drained to the GPC sump via the PMC drains. The contents of the GPC sump would have been transferred by eductor to tank 4D-10 in the liquid waste cell.

The VWR leaked on at least one occasion on July 7, 1972 and contaminated the underlying ram equipment room. The spill was cleaned up and the ram equipment room decontaminated on September 19, 1972. Liquids in the ram equipment room would drain from the cell via the floor drains to the plant interceptors. No further action is proposed for the ventilation wash room.

3.14.5 Associated Rooms

3.14.5.1 Ventilation Supply Room

The ventilation supply room (VSR) is located east of the process mechanical cell at a plant elevation of 34.90 meters (114.5 ft) (Fig. 13). The VSR is 4.88 meters (16 ft) wide, 20.32 meters (66.67 ft) long, and 4.88 meters (16 ft) high (Burn 1983). The VSR contains the main air intake air heater for the process building, a vacuum pump, and an air refrigeration unit.

The main intake air heater is a steam-operated heater designed to heat incoming outside air before distributing it to the process buildings main ventilation system. The vacuum pump supplies negative pressure for 85 to 100 air sampling stations that are used for monitoring radioactivity throughout the process building. The pump is lubricated with a high vacuum grease that does not contain RCRA hazardous constituents.

The air refrigeration unit supplies cooled air to the analytical laboratories. The unit uses chlorodifluoromethane, with the trade name Isotron (R) 22®, as a refrigerant to chill a 40% ethylene glycol/60% water solution that cools air supplied to the analytical labs. This refrigeration unit was installed in 1989-1990 to replace the original refrigeration unit that is still housed in the ventilation supply room. The original unit reportedly no longer contains any refrigerant. Records documenting its removal or disposition have not been located.

The VSR originally housed an instrument shop in a 2.44 meter (8 ft) wide, 2.44 meter (8 ft) long, and 4.88 meter (16 ft) high enclosed room along the west wall of the VSR. The structure was removed in 1989-1990 to make room for a new refrigeration unit. The shop contained equipment and tools used to calibrate and repair various plant instruments such as recording pens and dials. Small quantities of chemicals were used for cleaning equipment in the instrument shop. One to two liters of methanol a year was reportedly used on rags to clean the instruments in addition to other cleaners such as Windex®. The methanol was allowed to evaporate and was not poured down a drain since there are no drains in the VSR.

Based on this review, there are no indications that RCRA-listed hazardous waste or hazardous constituents are being managed in the ventilation supply room. Although methanol was reportedly used on rags to clean equipment in the instrument shop, small quantities were used and were allowed to evaporate to dryness. Releases of methanol from the VSR to the environment other than to the atmosphere is unlikely. No further action is proposed for this room at this time.

3.14.5.2 Ventilation Exhaust Cell

The ventilation exhaust cell (VEC) is located on the roof of the chemical process cell at a plant elevation of 45.11 meters (148 ft). The VEC contains the ductwork, filters, blowers, and controls for the process building's main ventilation system.

The VEC has two parallel filtration systems; one is used for operations and the other serves as a backup system. Each system is capable of exhausting 33,000 cfm of exhaust air to the main stack. Each blower is connected to a filter bank containing 30 roughing filters and 30 HEPA filters. The VEC also has a 5,000 cfm blower (15K-12) that exhausts air from the FRS through the main stack. Chemicals, other than lubricants for the blowers, are not used during operations in the VEC.

During this review no information was identified that indicates that RCRA hazardous waste or hazardous constituents are being managed in the ventilation exhaust cell. No further action is proposed for this area at this time.

3.14.5.3 Head End Ventilation Building

The head end ventilation (HEV) building is located on the east side of the master slave manipulator shop and is partly below grade at a plant elevation of (90 ft) (Fig. 4). The HEV was built in 1971 to provide the head end cells (process mechanical cell, chemical process cell, general purpose cell) with additional air flow and negative pressure to reduce airborne radiation in the crane rooms and infiltration of airborne radioactivity into operating aisles.

The HEV system supplies air to the north stairway and the contact size reduction facility from where it flows into the operating aisles and into the process mechanical cell and chemical process cell. The air supply equipment is located on the roof of the master-slave manipulator repair facility and includes a prefilter, supply air fan, and a supply heater. Air is discharged from the PMC and CPC to the general purpose cell where it passes through a 90 centimeter (36 in) duct to the HEV building inlet plenum.

The HEV building has two levels. The lower level houses the HEV filters, blowers, ductwork, and other associated equipment, while the upper level contains a crane and filter change equipment. The lower level is subdivided into a filter housing area, two glove port aisles, a blower room, an engine room, and air locks. The filter housing area contains the 90 centimeter (36 in) inlet duct and two identical filter trains each containing four filter banks.

The first bank is a prefilter composed of a 2.5 cm (1 in) thick treated fiber media mounted in a metal frame. The second filter is a roughing filter composed of pleated material in a rigid frame. The third and fourth filter banks are HEPA filters that are designed to remove at least 99.95% of particulates 0.3 micron diameter or larger. The HEV system has two primary blowers and one backup blower. The backup blower is powered by an electric motor.

Based on this review, there are no indications that RCRA-listed or characteristic waste or hazardous constituents are being managed in the HEV building. Spent filters are removed from the HEV building and are stored in shielded boxes in lag storage. The spent filters have not been characterized for RCRA purposes but will be at some future date (West Valley Nuclear Services Co., Inc. July 1993.) No further action is proposed for this room at this time.

3.15 Scrap Removal Room

The scrap removal room (SRR) is located north of the chemical process cell at a plant elevation of 30.48 meters (100 ft) (Fig. 3).

3.15.1 Cell Description and Control Features

The scrap removal room is 3.66 meters (12 ft) wide, 12.29 meters (40.33 ft) long, and 4.11 meters (13.5 ft) high (Burn 1983). The east wall, west wall, and ceiling are 1.07 meter (3.5 ft) thick concrete. The concrete floor is 1.07 meters to 1.62 meters (3.5 ft to 5.33 ft) thick and is partly covered with two strips of stainless steel. The strips are 1.22 meters (4 ft) wide and about 9.14 meters (30 ft) long and are anchored to the floor as treadways for the wheels of the scrap removal truck trailer. The remaining floor and walls are coated with carboline-based paint. The north wall is a 0.51 meter (1.67 ft) thick sliding shield door. The south wall facing the chemical process cell is 0.51 meter (1.67 ft) thick steel.

The SRR was equipped with internal spray heads for remote washing of the floor and shielding casks. There are two floor drains in the center of the cell. The northern drain connects with the interceptor while the southern drain opens to waste tank 12-35104 in the general purpose cell crane room. A removable plug allows waste solutions to be routed from one destination to the other.

A zinc bromide filled viewing window is located at the southeast corner of the cell and allows viewing from the west mechanical operating aisle.

A 1.0 meter by 1.22 meter (3.25 ft x 4 ft) hatch in the south end of the cell connects with the underlying general purpose cell. The hatch cover is hydraulically operated.

3.15.2 Historical Operations and Decontamination Activities

3.15.2.1 Historical Operations

During reprocessing, the scrap removal room received 30-gallon metal drums containing waste such as leached fuel hulls that were removed from the general purpose cell. The drums were placed in shielded transport casks on a truck trailer and transported to the NDA for burial. The cask, cell, and truck trailer were decontaminated with the spray heads before the trailer left the SRR.

3.15.2.2 Decontamination and Decommissioning Activities

The SRR was decontaminated in May 1972 (Riethmiller 1981). Sodium hydroxide, sodium tartrate decontamination solution, and a descaler of unknown composition were reportedly used during this decontamination. The SRR was decontaminated with water, Alconox® solution, and Chem-Clean® decontamination solution in July 1980 (Riethmiller 1981). Alconox® and Chem-Clean® are commercial detergents that do not contain hazardous ingredients listed in 29 CFR 1910 Subpart Z, or hazardous constituents listed in 40 CFR 261 (See Appendix A).

The SRR was decontaminated and decommissioned between March 1986 and September 1986 (Bridenbaker and Clemons 1987). Ten tanks containing spent FRS filter media, a radioactively contaminated work bench, a bridge-mounted crane, piping, and trash and debris on the floor were removed during the decommissioning of the SRR.

The tanks, walls, and floor of the SRR were decontaminated with a hydro-brush water spray with the radioactive waste water routed to the plant interceptor for treatment. After the tanks, workbench, and other material were removed, the walls, floor, and ceiling of the SRR was further decontaminated with repeated applications of AE-3003, a cleaner containing sodium hydroxide and isopropanol, that was mixed with Fome-Add, a nonhazardous foam stabilizer. The room was then painted with 2-part epoxy paint to seal in remaining residual radioactive contamination.

3.15.3 Current Conditions

The 1986 decontamination event reduced radiation levels in the SRR to less than 1.0 mR/hr (West Valley Nuclear Services, July 29, 1993). Since 1987, the SRR has been used to store a 2840 liter (750 gal) tank that contains material removed from tank 7D-13, the low-level waste catch tank (former laundry and analytical drain catch tank). The contents of the tank in the SRR is scheduled to be sampled.

Tank 7D-13 formerly received liquid from the laundry and the analytical laboratory drains. It currently receives low-level radioactive solutions from the analytical and process chemistry laboratory drains and drum flush solutions from the cement solidification system.

3.15.4 Conclusions: Potential for Release

It is not anticipated that RCRA-hazardous waste or hazardous constituents are currently being managed in the 2,840 liter (750 gal) tank in the scrap removal room, however, a final determination will be made once the contents of this tank are analyzed.

There have been no known releases of any material from the SRR to the environment. Decontamination solutions used to decontaminate the cell would have been sent to either the low-level waste treatment facility or tank 8D-2 for management. Future actions will be evaluated once the contents of the tank have been evaluated.

3.16 Master Slave Manipulator Shop

The master slave manipulator (MSM) shop is a 11.28 meter (37 ft) wide, 12.80 meter (42 ft) long, and 4.6 meter (15 ft) high concrete cell located north of and adjacent to the manipulator repair room at a plant elevation of 30.48 meters (100 ft) (Fig. 4). The MSM may be entered through a doorway at the southeast corner of the shop that connects with mechanical operating aisle.

The MSM shop was built in 1970 to receive, decontaminate, and repair master slave manipulators that were used in hot chemical cell and laboratory work. The shop was used from 1970 through 1974 although there was not much activity in 1973 and 1974. The manipulators were mainly decontaminated with Alconox® and Radiacwash®. Turco® decontamination products were also used but not as extensively as Alconox® or Radiacwash®. The decontamination solutions would have drained to floor drains that connected to an underground 5,678 liter (1,500 gal) stainless steel tank (15D-6) east of the MSM shop. Some organic solvents may have possibly been used to degrease the manipulators in the 1970s but this is not entirely certain. However, spent solvents would normally have been placed in containers filled with sorbent and disposed of as solid waste and not discharged to 15D-6.

Tank 15D-6 does not have spill containment but is equipped with a level recorder, high-level alarm, and a stainless steel monitoring well adjacent to the tank.. Although the floor drains in the MSM shop are sealed, the tank is currently about 60% full from liquids that were transferred in the late 1980s. The liquid in 15D-6 was analyzed in

July 1993 for TCLP volatiles, semivolatiles, and metals. All results were below the TCLP MCLs listed in 40 CFR 261.24. The liquid has been classified as non-hazardous waste as it does not exhibit RCRA hazardous characteristics and process knowledge does not suggest that RCRA-listed wastes were transferred to 15D-6. It is not presently known whether organic solvents were used in the MSM shop in the 1970s. If organic solvents were used they would have been placed in sorbent material and disposed as solid waste.

The MSM shop was decontaminated and renovated between July 1982 and June 1983 (Phillips and Golden 1986). All material and equipment was removed and disposed of before decontamination. The walls, ceiling, and overhead structures were decontaminated and painted with an epoxy-type paint.

Since radioactivity had penetrated deeply into the concrete floor, it was physically removed and disposed of as low-level radioactive waste in the NRC-licensed disposal area. After decontamination, a new concrete floor was poured and it was covered with a welded stainless steel liner that extended 0.457 meters (1.5 ft) up the walls. A 0.61 meter (2 ft) thick concrete shield wall was also added to the east wall of the MSM shop during decontamination.

The MSM shop is currently used to repair and adjust 25 to 30 manipulators a year. Before they are repaired, the manipulators are decontaminated in a separate stainless steel-lined decontamination area located northeast of and adjacent to the MSM shop. Large volumes of liquids are not used for decontamination as the manipulators are normally decontaminated with Windex® and wipes. On occasion, Simple Green®, a non-hazardous oil dispersant, is used to wipe down the manipulators. The decontamination area and MSM shop are stainless steel-lined and equipped with floor drains that connect to 15D-6. All floor drains are currently sealed and liquids are not flushed to 15D-6.

The MSM shop does not manage RCRA hazardous waste or hazardous constituents and there have been no known releases of material from the MSM shop to the environment. No further action is proposed for this room at this time.

4.0 Conclusions

The historical operations conducted in the sealed rooms in the process building were reviewed to determine whether RCRA-regulated hazardous waste or hazardous constituents were associated with or released from the rooms to the environment. Conventional waste characterization methods involving direct sampling is not practical as the sealed rooms are restricted access areas due to the high radiation levels inside them.

The head end cells (process mechanical cell, general purpose cell, and miniature cell) have not been entered since 1966, when fuel reprocessing operations began in the process building. The remaining rooms have been entered infrequently during the past twenty-eight years to perform radiation surveys or decontamination activities. The entries were usually of short duration to minimize exposure.

The review of the process history demonstrates that no known RCRA-listed wastes are present inside the rooms. The rooms and some of the vessels may contain RCRA characteristic wastes such as corrosive liquids or metals, but this is not entirely certain since the contents have not been sampled due to the radiation levels associated with the areas.

The floors and parts of the walls of seven of the rooms - the PMC, GPC, MC, XC-1, XC-2, LWC, and the pump niches - are lined with welded stainless steel. This lining provides various amounts of secondary containment in these rooms to contain any spills that may have occurred during operations. The containment capacity was sufficiently large that it would only be exceeded during a sudden, simultaneous catastrophic release of liquid from several vessels within the rooms. This situation never occurred during reprocessing.

Although the condition of the lining in these rooms is unknown, the liners and their welds in XC-3, the product purification cell, and two of the pump niches were observed to be in good condition during the decontamination work that was performed in these cells during the mid-1980s. The liners in the seven sealed rooms should be in similar condition. The poured concrete floors beneath the liners are 0.91 meters to 1.68 meters (3.0 to 5.5 ft) thick and would have provided additional containment ability.

The acid recovery cell, acid recovery pump room, off-gas cell, ram equipment room, hot acid cell, off-gas blower room, and the ventilation wash room were not equipped with stainless steel liners. Chemical reprocessing operations were not performed in the ram equipment room, off-gas blower room, or ventilation wash room. The acid recovery cell, acid recovery pump room, off-gas cell, and hot acid cell were either directly or indirectly involved in chemical reprocessing operations. Acid spills in the acid recovery cell, acid recovery pump room, and off-gas cell eroded the concrete floors of these unlined cells. Radioactively contaminated liquid was released to the environment from an underground process line near the acid recovery pump room in 1967, however, this line was taken out of service based on piping diagrams.

The rooms were also equipped to collect and remove any liquids that may have accumulated. The general purpose cell, miniature cell, extraction cells 1 and 2, and the liquid waste cell contained stainless steel-lined sumps equipped with steam eductors to transfer liquid aboveground to various process vessels in the building. The PMC, HAC, OGBR, VWR, and the pump niches drained to stainless steel-lined sumps in adjacent cells. The acid recovery cell concrete sump was emptied to the general purpose evaporator and the off-gas cell concrete sumps were emptied to the solvent waste hold tank in the liquid waste cell. The ARPR and RER had floor drains that conveyed any liquid to the interceptor and the LLWTF. With a few exceptions there was no underground piping associated with the process cells.

The air discharged from every sealed room was treated in one of the process building's four ventilation systems before release from the main stack. The air discharge streams passed through a filter train containing a series of prefilters, roughing filters, and HEPA filters. The HEPA filters are able to remove 99.95% of airborne particulates that are greater than or equal to 0.3 micron (0.0003 mm) diameter.

With the exception of the release from the underground process line near the acid recovery pump room, there have been no known releases of material from the rooms to the environment. The stainless steel liners, sumps, drains, ventilation system, and the location of some of the rooms within the process building have deterred releases to the environment.

5.0 Recommendations

A characterization of the sealed rooms in the process building was requested by the U.S. Environmental Protection Agency and the New York State Department of Environmental Conservation to aid in documenting known information on the construction and current condition of the rooms, whether hazardous constituents were utilized in the rooms, and the potential for releases from the rooms due to lack of liners or the presence of unlined sumps. This paper characterization was conducted due to the high radiation fields in these rooms and as low as reasonably achievable (ALARA) exposure concerns preventing manned entries.

The evaluation of the sealed rooms did not identify a release of hazardous waste or hazardous constituents to the environment. This evaluation is supported by the fact that many of the rooms are lined with stainless steel liners and do not have penetrations in the liner. Below ground rooms equipped with sumps were designed with eductor systems such that liquids collected in the sumps were drawn upward through pipes and do not gravity drain through the bottom of the floor. For below grade rooms, any release would be into the room due to the fact that the groundwater table is higher than the sump elevation. This process would be further assisted by negative air pressure maintained in the rooms.

As part of the RCRA Facility Investigation for these and other units at the site, an expanded subsurface soils sampling and groundwater monitoring program (two expanded monitoring rounds) is currently being conducted at the WVDP. This data is currently being validated and evaluated for purposes of characterizing the nature and extent of chemical contamination at the site. Chemical data for the first round of expanded groundwater did not identify the presence of hazardous constituents in wells downgradient from the process building. In addition, RCRA Facility Investigations are being conducted for other SSWMUs in and around the process building, including the liquid waste treatment system (SSWMU 3) and the high level waste storage and processing area (SSWMu 4). These reports will complement our understanding of the environment around the process building.

Should the data from the expanded monitoring program (both soils and groundwater) or investigation of the other units in close proximity to the process building indicate or point to a release from the sealed rooms, a subsequent investigation of these rooms would then be undertaken. Based on the results of this investigation, further evaluation does not appear warranted at this time.

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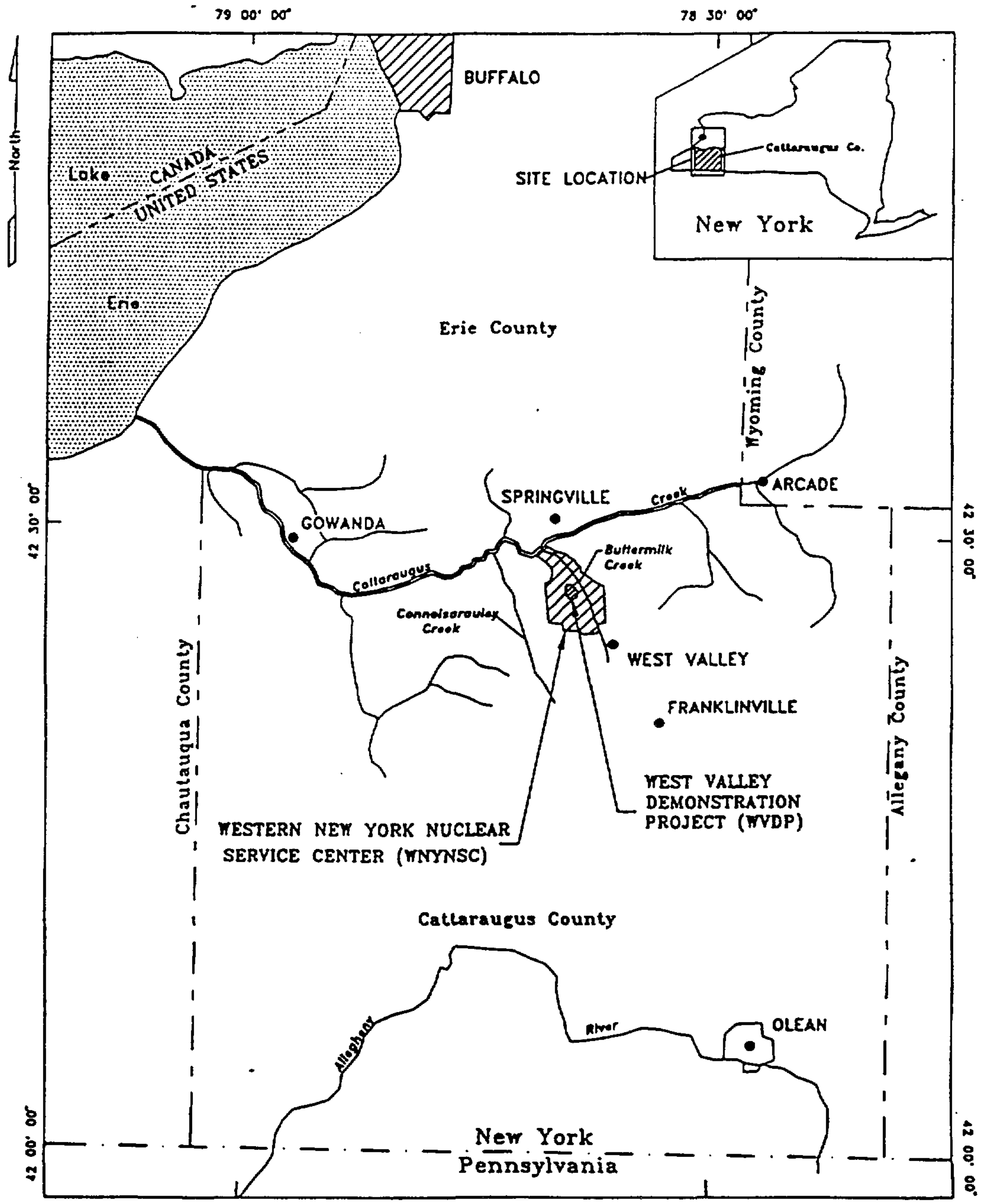


Figure 1
Location of the
Western New York Nuclear Service Center

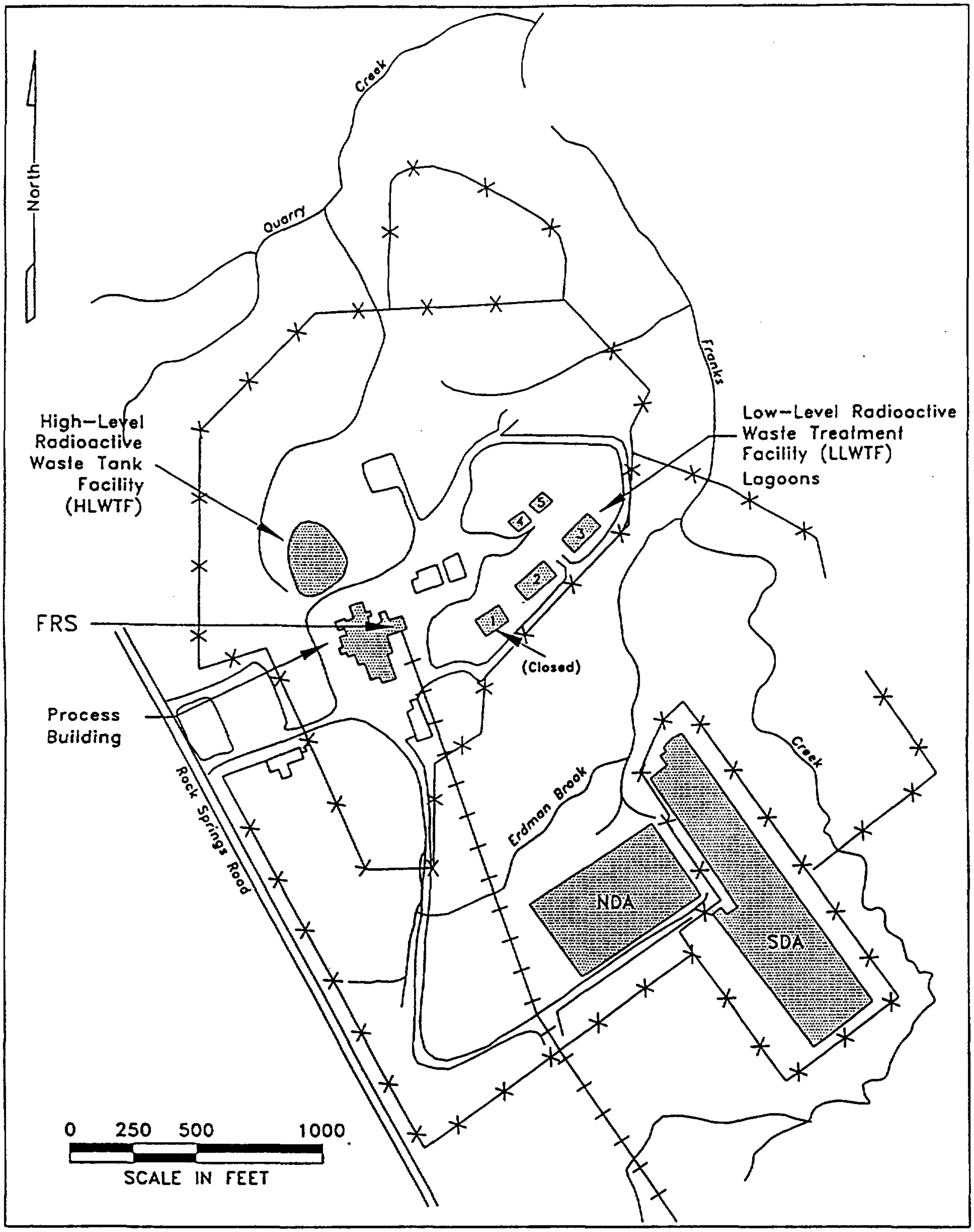


Figure 2 Location of the Process Building at the West Valley Demonstration Project

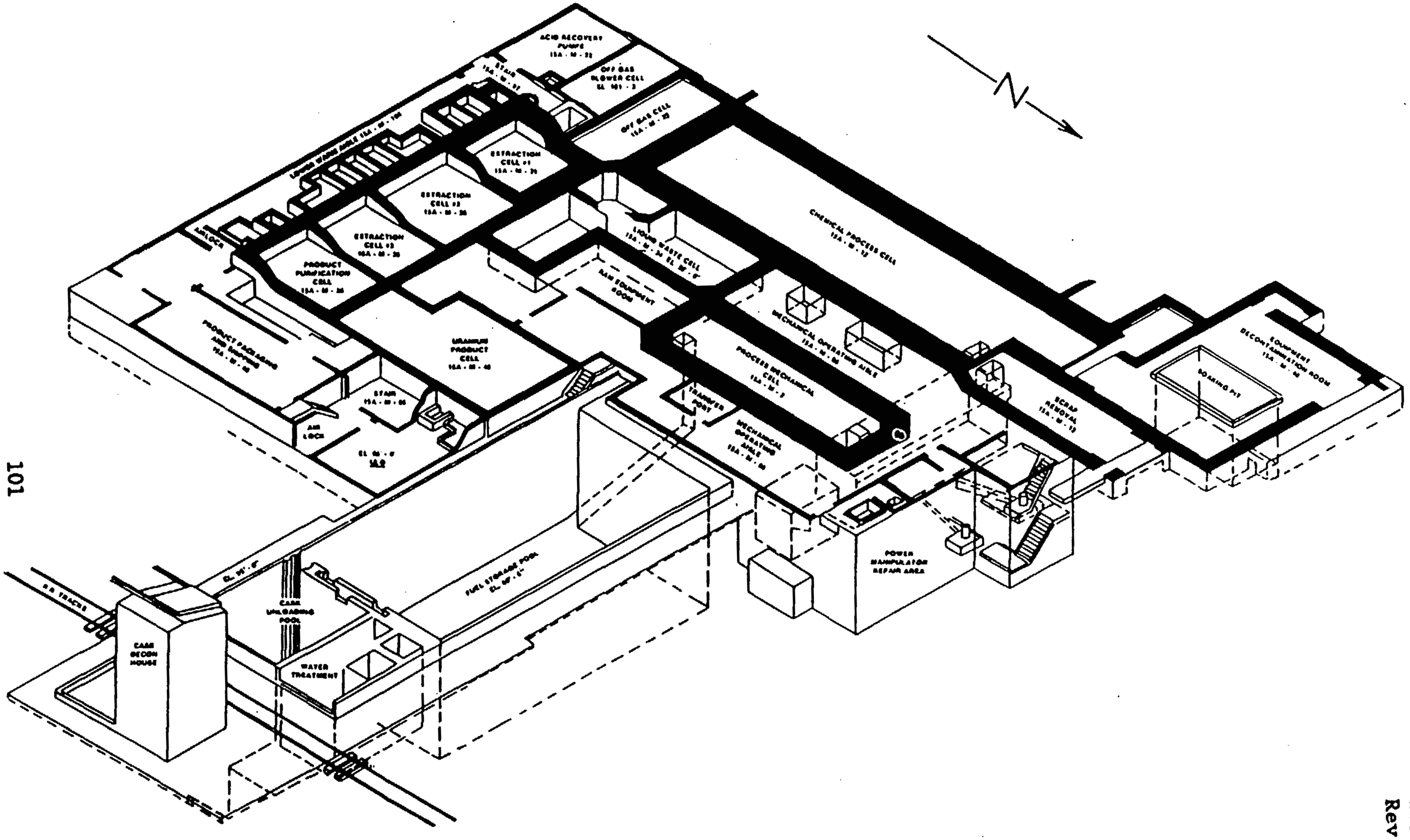


Figure 3 - Layout of the Process Building at a Plant Elevation of 30.48 meters (100 ft)

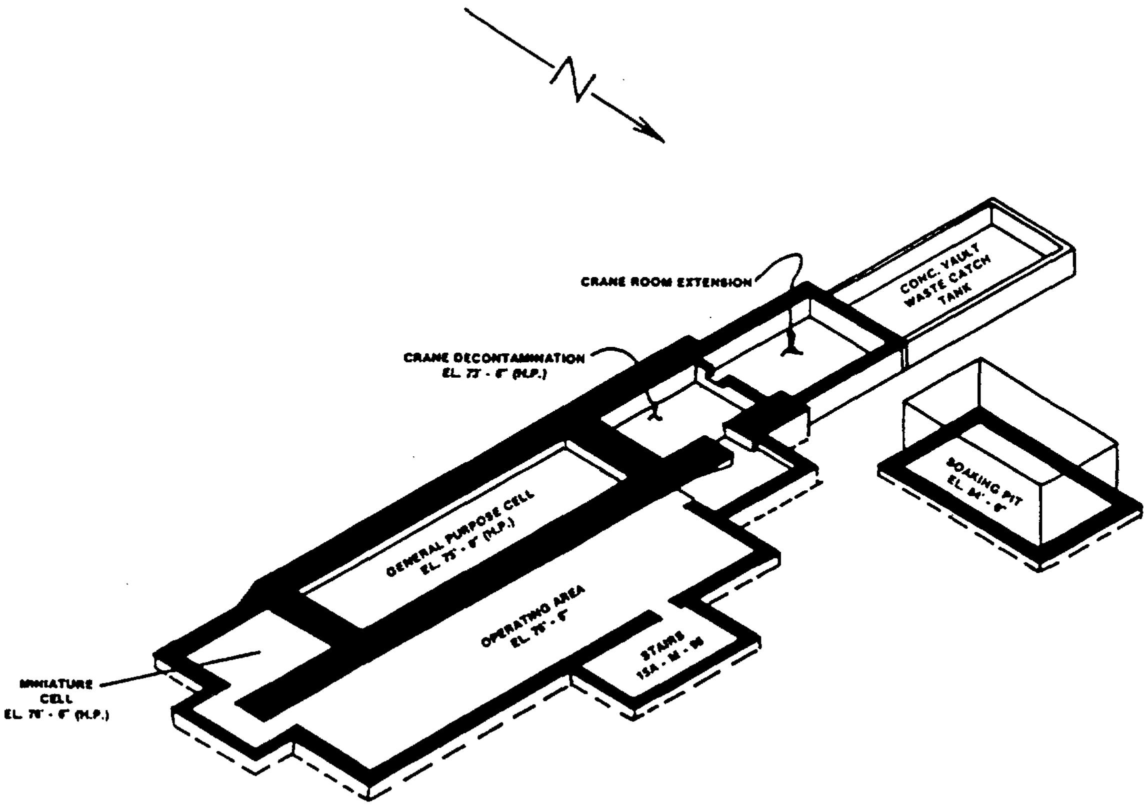


Figure 3a - Below Grade Layout of the Process Building

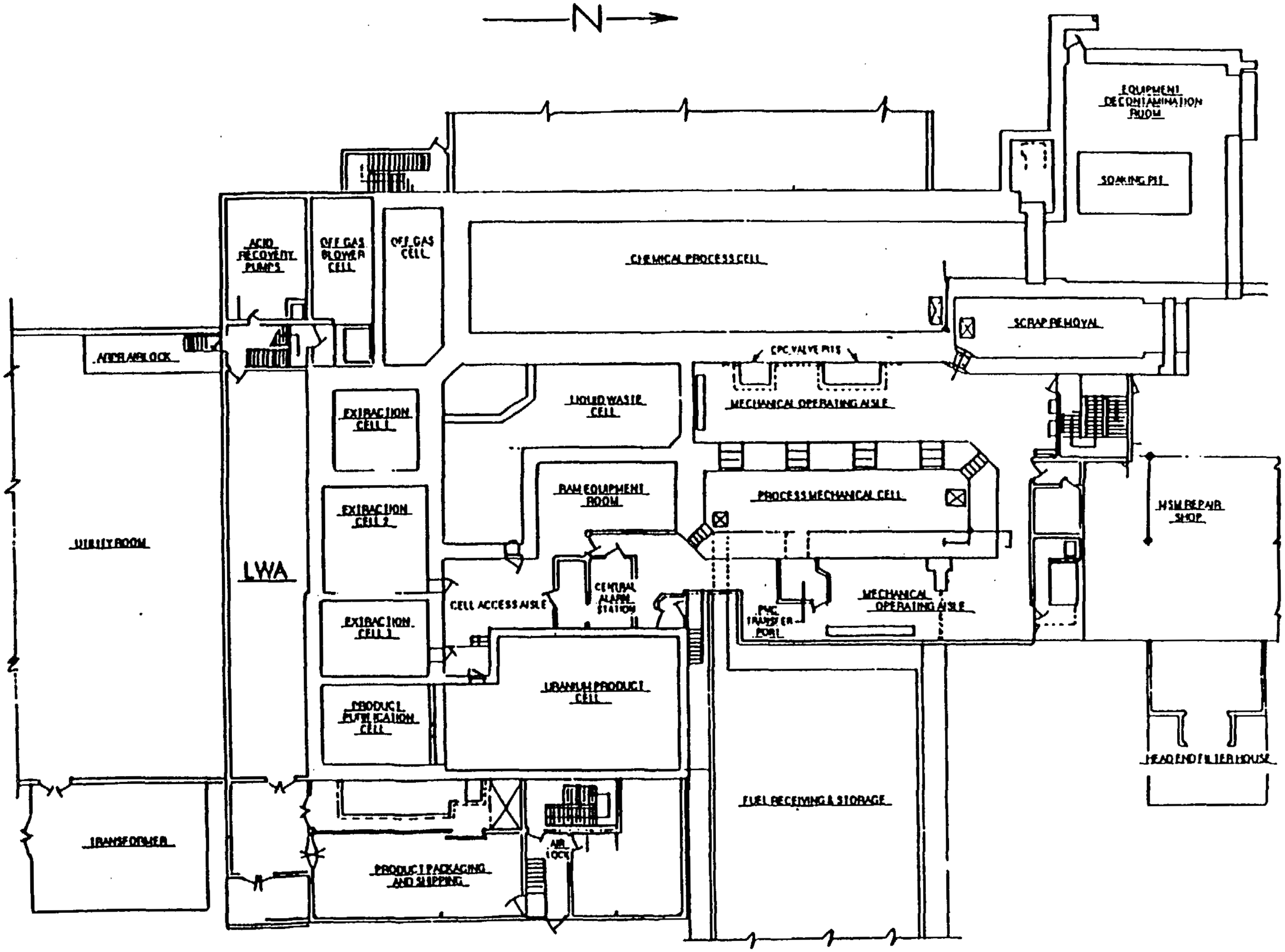
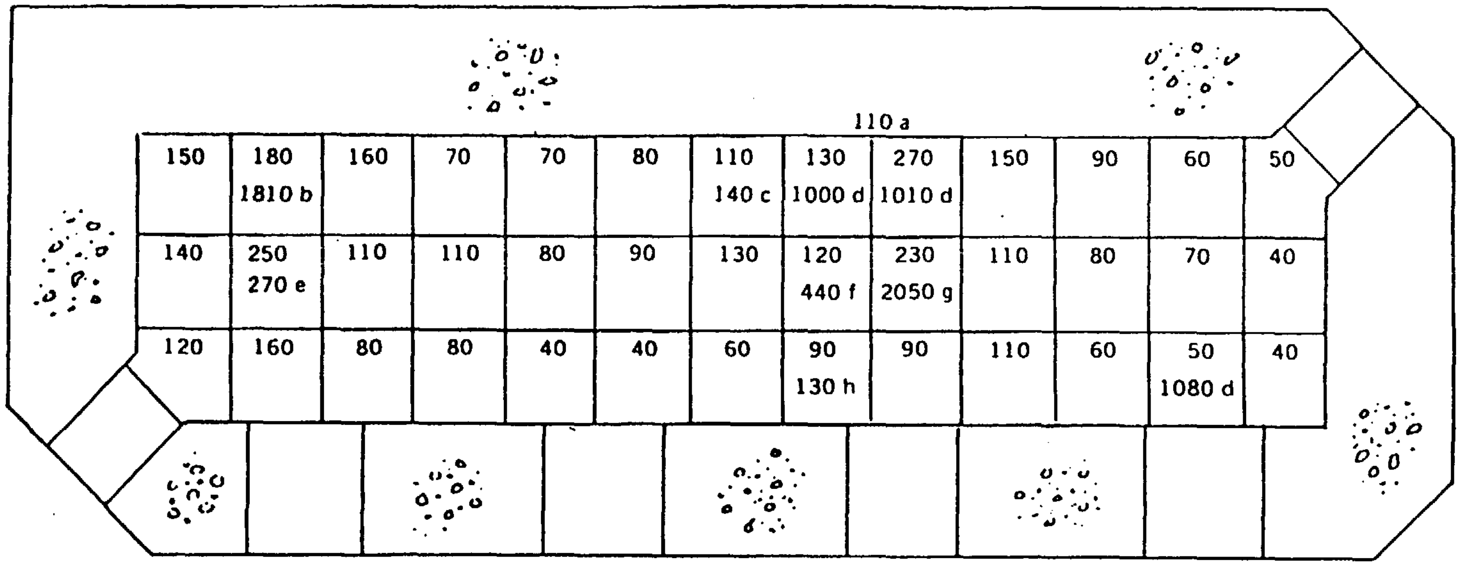
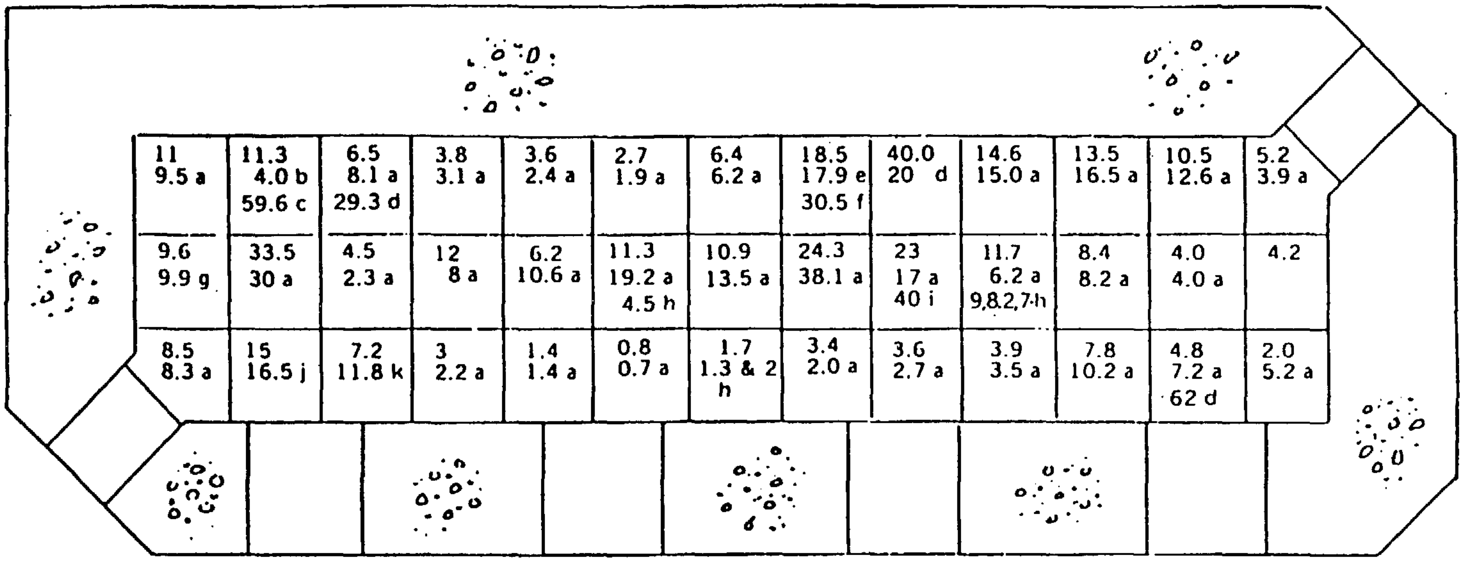


Figure 4 - Floor Plan of the Process Building at a Plant Elevation of 30.48 meters (100 ft)



NOTES:
a. At filters on wall
b. In shear hatch
c. At NPR fuel can
d. At floor
e. On shear
f. In saw sump
g. Below saw blade
h. At MSM fingers

Figure 5 - Gross Beta-Gamma Radiation Intensities in the Process Mechanical Cell



NOTES:
a. 1 m (3 ft) from floor
b. 10 cm (4 in) above shear
c. 30 cm (1 ft) above vent
d. Near floor
e. Near end fittings
f. Near NPR fuel can
g. 30 cm (1 ft) above open hatch to GPC
h. At top of drum(s)
i. At rail
j. 30 cm (1 ft) over table
k. 30 cm (1 ft) over Yankee Fuel Can

Figure 6 - Collimated Gamma Radiation Intensities in the Process Mechanical Cell

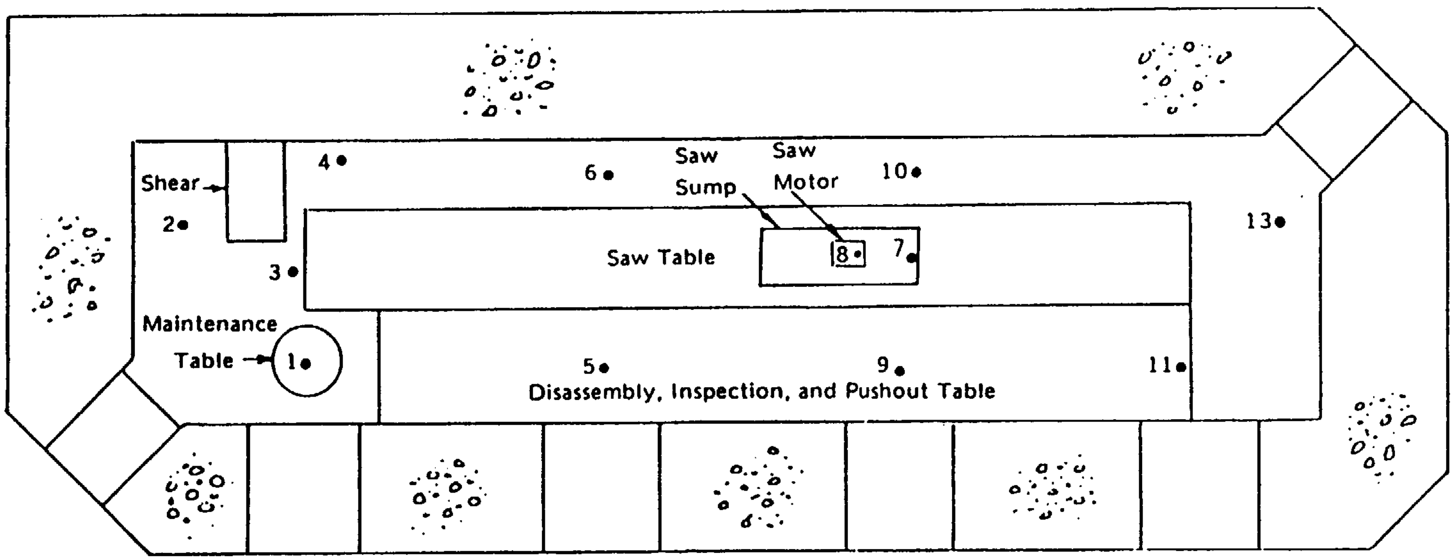
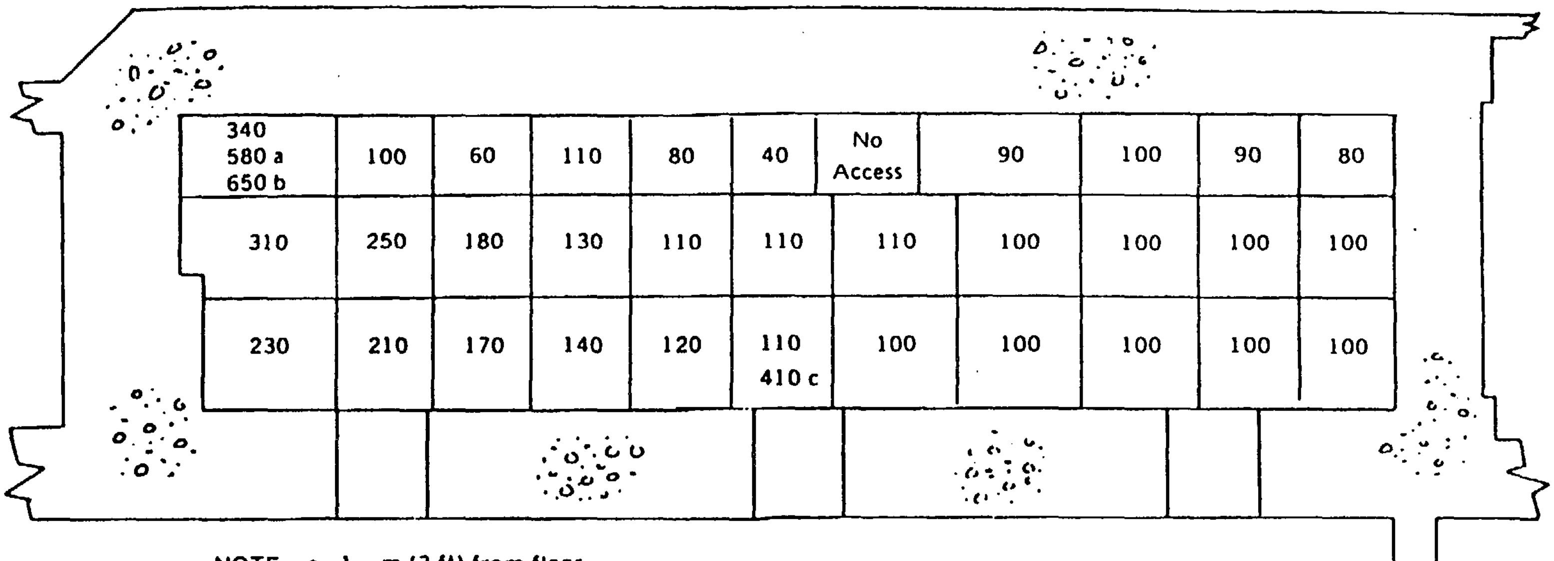
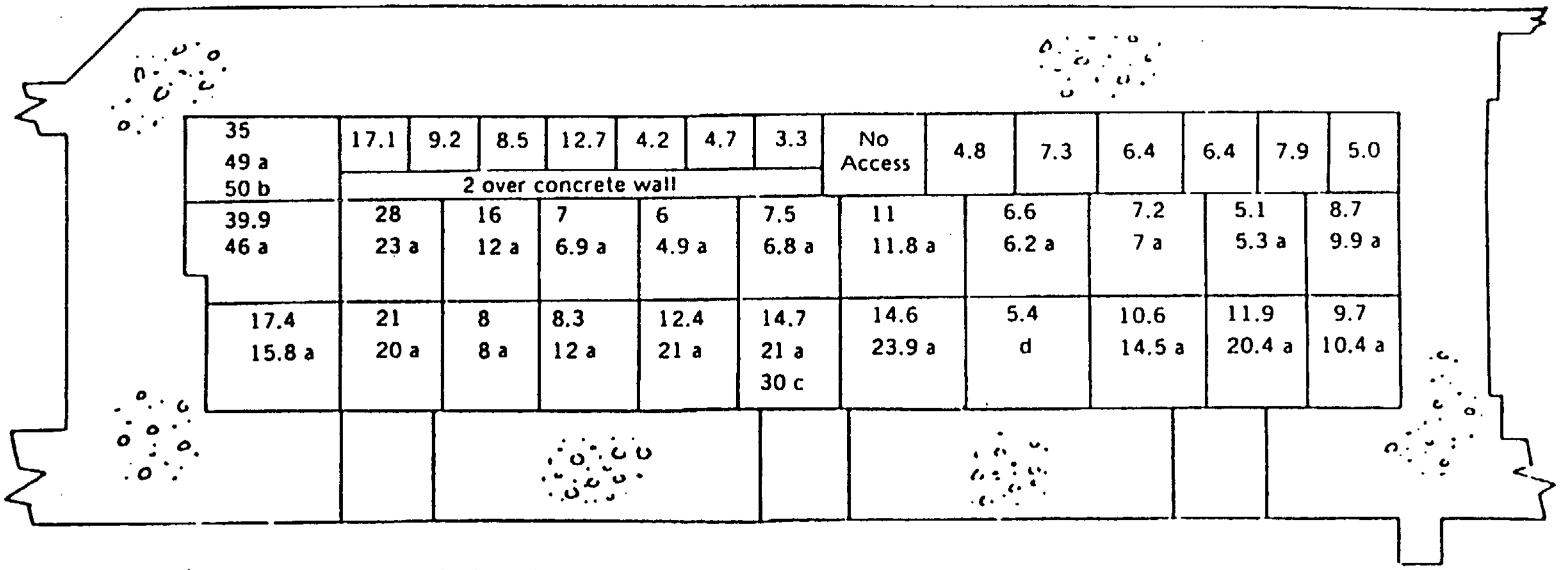


Figure 7 - Sample Locations in the Process Mechanical Cell



NOTE: a. 1 m (3 ft) from floor
b. 0.6 m (2 ft) from floor
c. 0.3 m (1 ft) from floor

Figure 8 - Gross Beta-Gamma Radiation Intensities in the General Purpose Cell



NOTES:
a. 1 m (3 ft) from floor
b. Near floor
c. 0.3 m (1 ft) from floor
d. No access at 1 m (3 ft) from floor

Figure 9 - Collimated Gamma Radiation Intensities in the General Purpose Cell

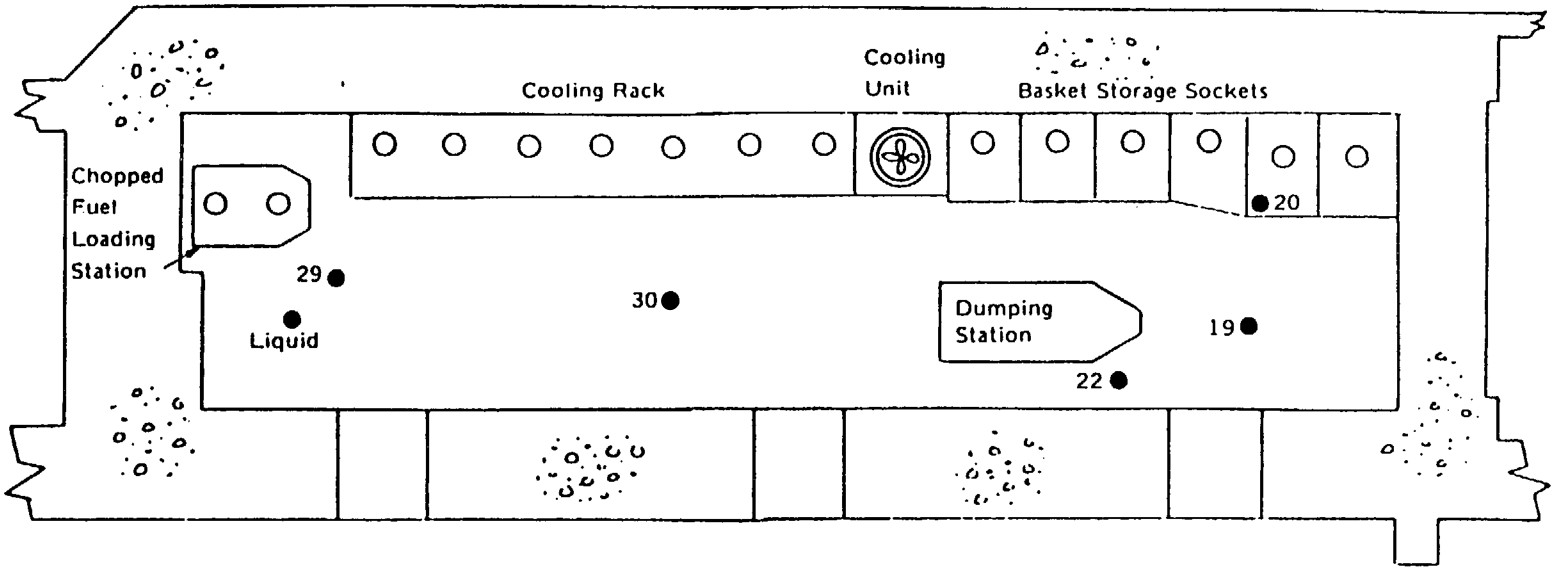


Figure 10 - Sample Locations in the General Purpose Cell

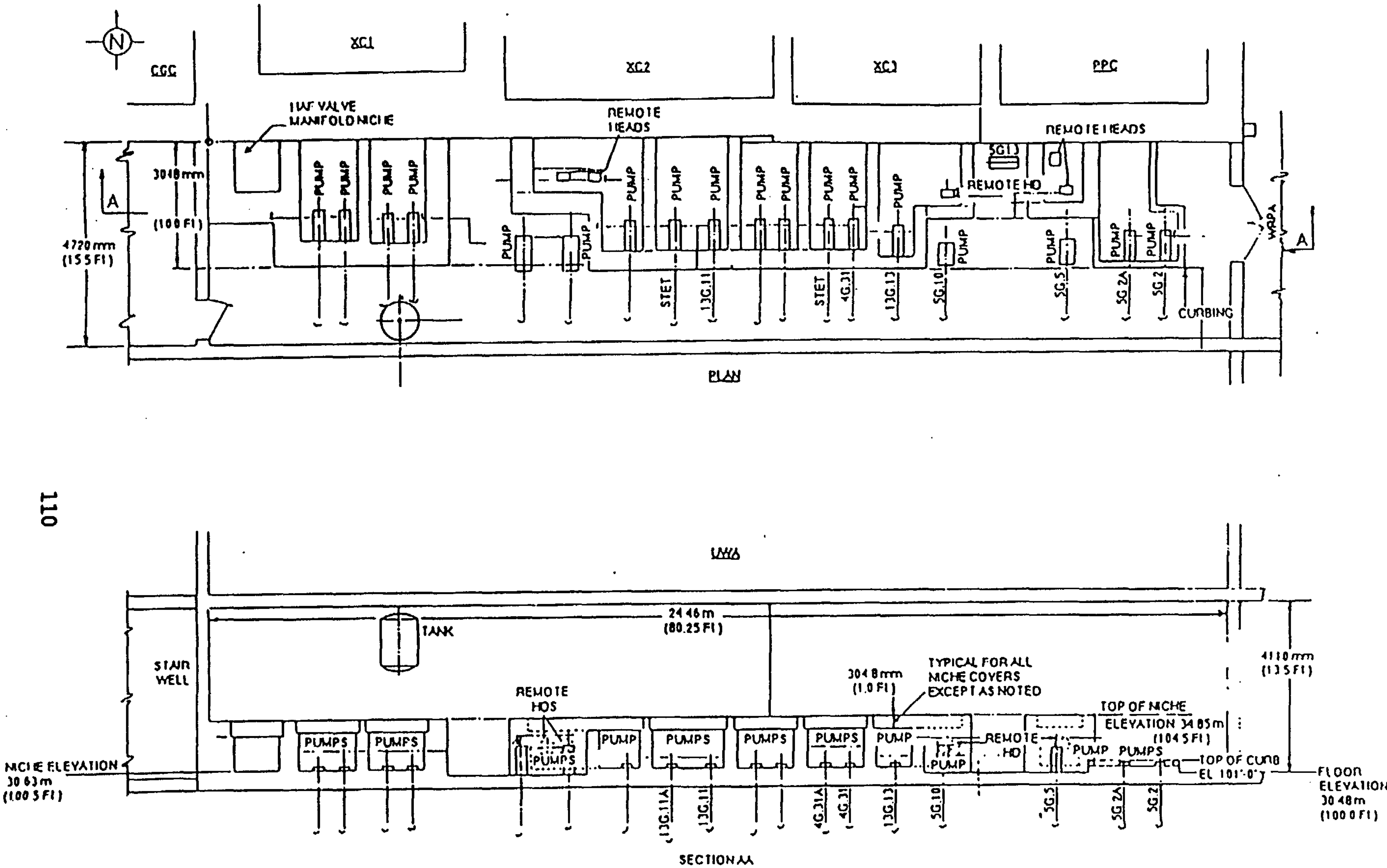


Figure 11 - Equipment Arrangement of the Lower Warm Aisle - Plan and Section Views

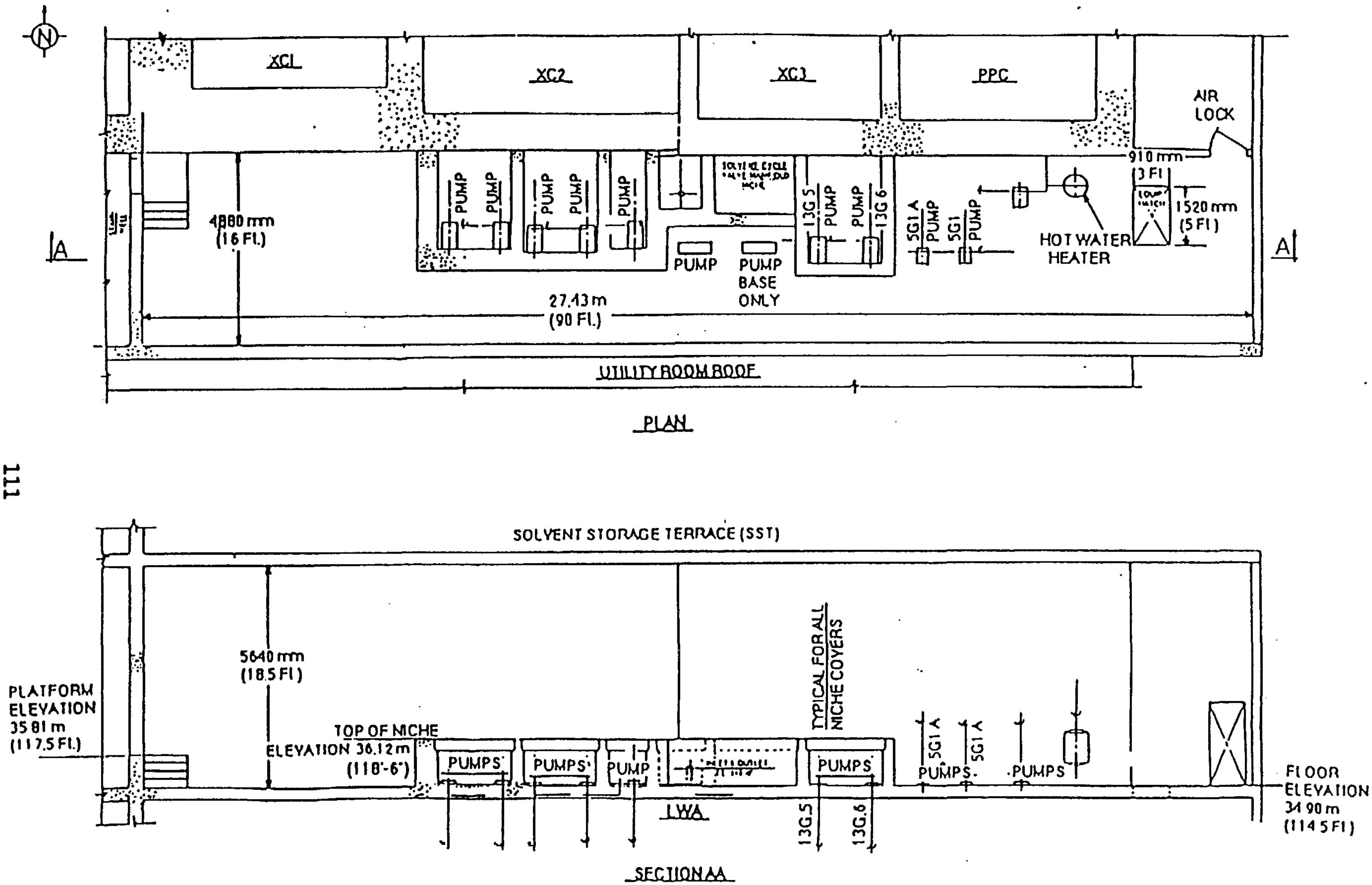


Figure 12 - Equipment Arrangement of the Upper Warm Aisle - Plan and Section Views

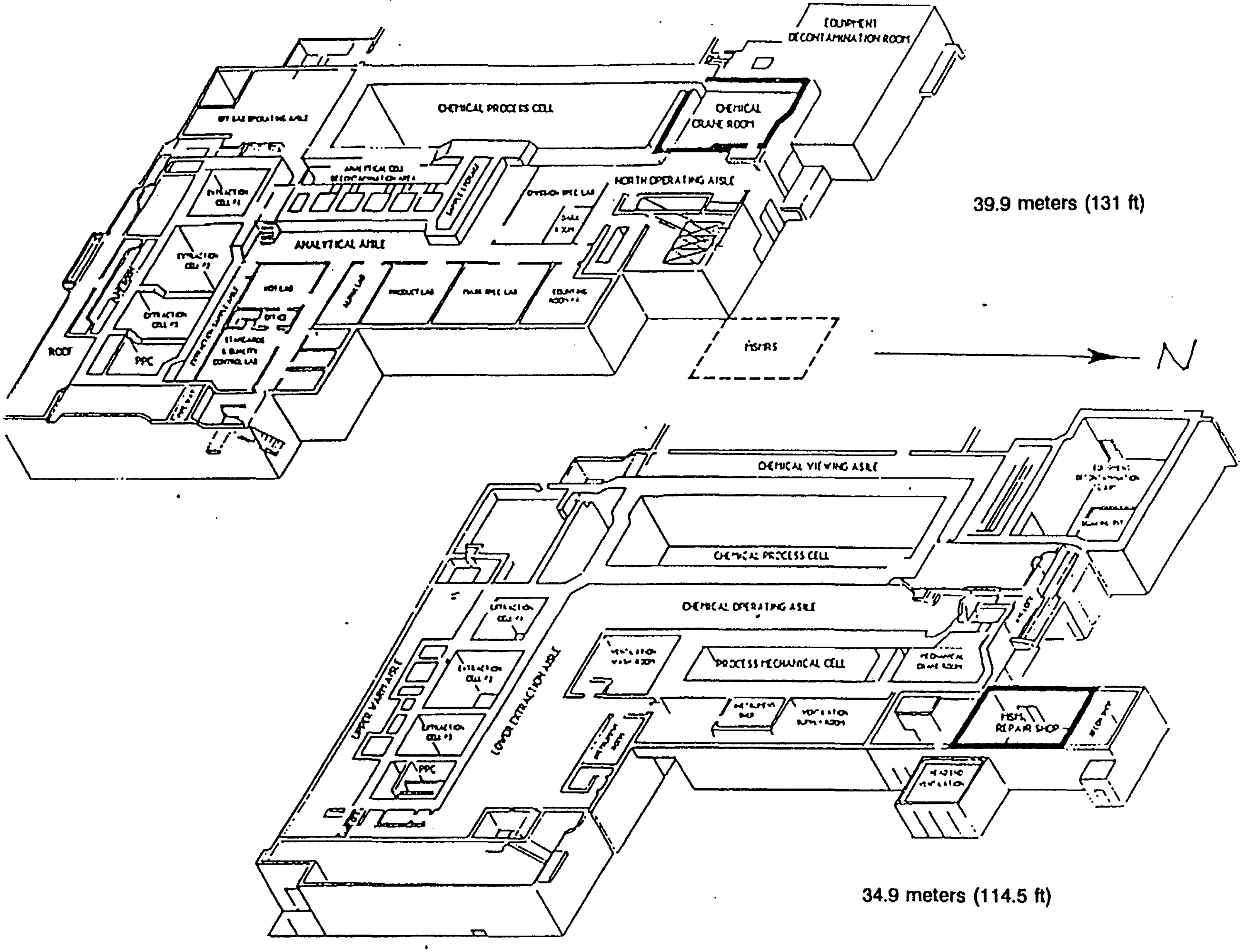


Figure 13 - Layout of the Process Building at Plant Elevations of 34.9 meters (114.5 ft) and 39.9 meters (131 ft)

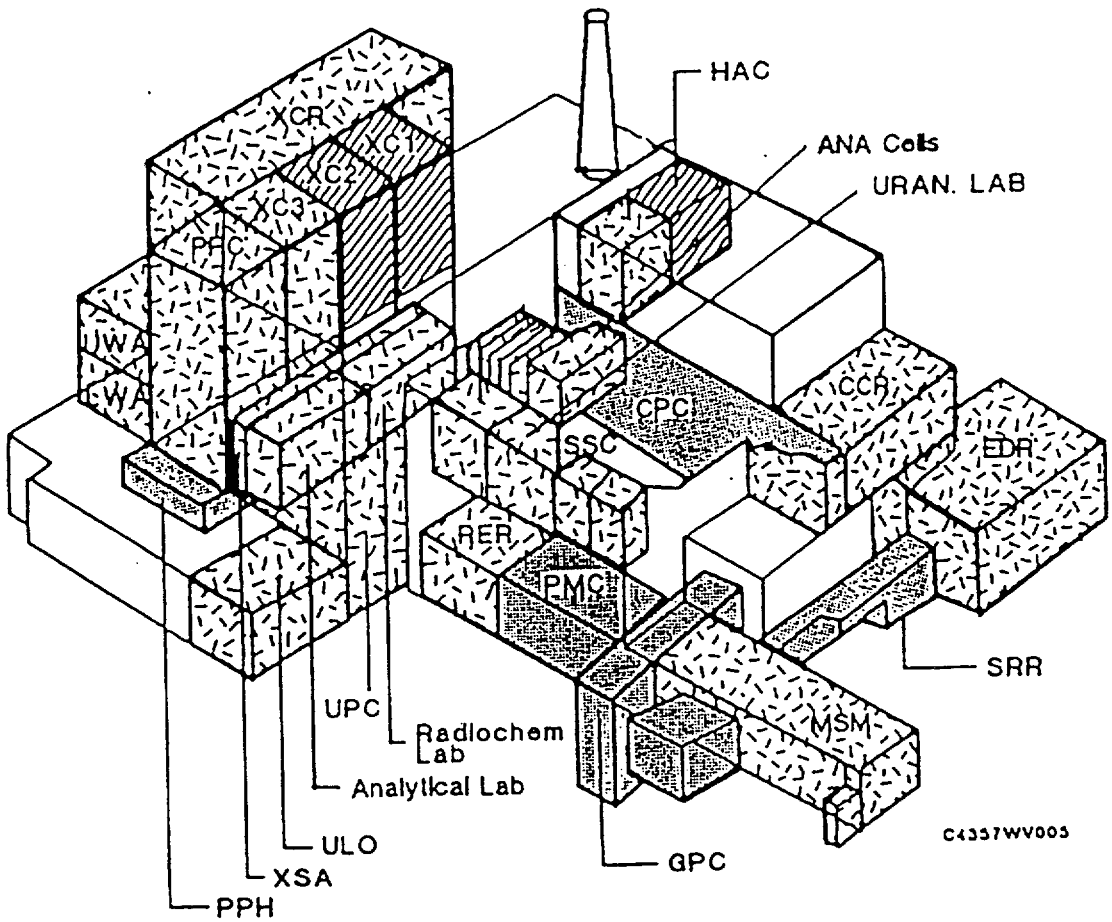


Figure 14 - Location of the Hot Acid Cell (HAC)

Table 1

Process Mechanical Cell Original Equipment List

Equip. No.	Description	Material	Dimensions
15E-11	PMC Cooler	304L Stainless Steel	2'10" x 3' x 5'1"
2M-1	Shielded Viewing Windows Oper. Aisle PMC (windows A, B, C, and D)	Oil Filled	5' x 5' x 5'6"
2M-1E	Window Plug, East MOA	Not Found	
2M-2	Crane Maintenance Door PMC-MCR	Carbon Steel/Concrete	17'6" x 16'9" x 3'
2M-3	Shielded Viewing Windows, Corner PMC	Lead glass, oil infill	4' x 4" x 5'6"
15T-53	PMC Filter	Aluminum	9" ϕ x 43½"
15T-55	PMC Filter	Aluminum	6" ϕ x 42"
15T-56A	Shear Filter	304L, charcoal filled	6" ϕ x 4'2"
15T-56B	Shear Filter	304L, charcoal filled	6" ϕ x 4'2"
2V-1A	Fuel Handling Bridge Cranes, PMC	Not Found	150" x 6" x 12"
2V-1B	Fuel Handling Bridge Cranes, PMC	Not Found	150" x 6" x 12"
2V-2	Disassembly Saw & Push Out Table	Not Found	
2V-4	Fuel Bundle Shear	Not Found	
2V-5	Pin Shear	Not Found	
2V-6	Bridge-Mounted Power Manipulator	Not Found	
2V-8	Extended Reach H.D. Masterslave Manipulator	Not Given	84" x 5" x 5"
2V-8E,F,G	Pair M-S Manipulator Insert Plugs	Plugs - Aluminum, Retaining Bars - 304L Stainless Steel, All Other Material - Carbon Steel	12½" ϕ x 6'¾
2V-11	Disassembly, Inspection & Pushout Table	Stainless Steel	

Table 1 (concluded)

Process Mechanical Cell Original Equipment List

2V-14	Maintenance Table	Stainless Steel	156" x 37" x 1"
2V-27	PMC GPC Hatch Cover	Stainless Steel	
2V-30	Hatch Cover for Transfer from FRS	Stainless Steel	
2V-44	Fuel Element Tilting Fixtures	Stainless Steel	Boom 15'1" long
2V-45	Mech Processing Fixture & Adaptors	Not Found	
2V-46	PMC Mirrors	Not Found	
2V-61	Fuel Grapples	Not Given	2", 2⅜" tubing various lengths 3" to 20'
2V-87	Fire Protection	Not Found	
2V-88	Strong-Back for Scrap Drum Handling	304L Stainless Steel	1¼ ϕ x 2'1"
2V-92	PMC Periscope Plugs	Not Specified	4" ϕ x 4'5¾"
11V-1	One-Ton Hoist and Monorail	Not Found	
11V-2	Transfer Hatch Cover	Not Found	
15V-71	Packaged CO_2 Fire Fighting Equipment	Not Given	Not Given

ϕ = diameter

Table 2

Analyses of Loose Solids Sampled from the Process Mechanical Cell

Sample Cartridge No.[1]	1	2	3[2]	4	5	6	7	8[2]	9	10	11	13
Volatiles (wt. %)	13.3	13.0		35	41.9	16.0	7.7		11.1	34.6	9.2	2.8
Total Uranium (wt. %)	60.5	3.8		3.32	.771	.498	3.8		.785	1.79	15.7	.769
Activity (Ci/g)												
Co-60	20	20		580	29	6	900		3	26	280	5
Cs-134	80	4			LTD						LTD	7-10
Cs-137	20,300	1,380		330	160	1.1	670		151	540	1,200	235
Eu-155	LTD	LTD		1	.6	LTD	LTD		.3	2	4-8	LTD
Pb-212				LTD	LTD	LTD	LTD		LTD	LTD		
U-235	LTD	LTD		LTD	LTD	LTD	LTD		LTD	LTD	LTD	LTD
Pu-238	250	.09		18	4	2	11		2.3	4	16	5
Pu-239/240	210	.07		18	3	2	11		2.2	5	30	5
Am-241	130			9	6.2	3	10		3	19	40	6

(Vance 1986)

(1) See Figure 7 to relate sample cartridge numbers to sample locations.
(2) Insufficient loose solids were collected for analysis.
LTD - Less than detectable.
Volatiles - Indicates percentage of sample lost when sample was evaporated to dryness.

Table 3

Fissile Material Mass Inventory in the Ram Equipment Room (RER): Chemical Composition and Isotopic Distribution

Container Markings A	Source Area	Chemical Composition	Fissile Mass, g	Isotopic Distribution - Weight Percent						
				Pu-238	Pu-239	Pu-240	Pu-241	Pu-242	U-235	U-238
XSA Material	XSA	$Pu(NO_3)_4$	57	1.0	75.0	15.0	8.0	1.5		
XSA Material	XSA	$Pu(NO_3)_4$	57	1.0	75.0	15.0	8.0	1.5		
W/O 3205-1	AL	$Pu(NO_3)_4$	42	0.5	72.8	20.0	5.0	1.7		
		$Pu(NO_3)_4$	67	0.4	76.1	17.6	4.6	1.2		
W/O 3205-2	AL	$Pu(NO_3)_4$	41	1.0	74.7	14.8	7.9	1.6		
		$Pu(NO_3)_4$	86	0.4	81.0	13.7	4.0	0.9		
W/O 3205-3	AL	$Pu(NO_3)_4$	2	1.0	74.9	14.7	7.8	1.6		
		PuO_2	4		80.0	20.0				
W/O 3205-4	AL	$Pu(NO_3)_4$	1	1.0	74.9	14.7	7.8	1.6		
		$UO_2(NO_3)_2$	1						0	100.0
Seal-0312	AL	$Pu(NO_3)_4$	3	1.0	75.0	15.0	8.0	1.5		
Seal-0313	AL	$Pu(NO_3)_4$	14		93.0	7.0				
No Markings	AL	$Pu(NO_3)_4$	17	1.0	75.0	15.0	8.0	1.5		
TD-497	PSC-1	$UO_2(NO_3)_2/Pu(NO_3)_4$	17	1.0	75.0	15.0	8.0	1.5	9.0/13.0[B]	9.0/87.0[B]
TD-602	PSC-1	$UO_2(NO_3)_2/Pu(NO_3)_4$	51	1.0	75.0	15.0	8.0	1.5	9.0/13.0[B]	9.0/87.0[B]
TD-501	ULO	$UO_2(NO_3)_2$	19						5.0	95.0

Total Fissile Material Mass = 479 grams

A - All drums utilize 19-Liter lidded metal pails for internal containment.

B - The uranium enrichment for PSC-1 material is 9.0 weight percent U-235 for the reddish brown material and 13.0 weight percent for the black material.

Table 4

General Purpose Cell Original Equipment List

Equip. No.	Description	Material	Dimensions
15E-12	GPC Cooler	304L Stainless Steel	3'½" x 2'5" x 6'2⅜"
2M-6	Radiation Shielding Windows, A, B & C	Oil Filled	4'8" x 4'8" x 4'0"
2M-7	Crane Maintenance Door GPC-GCR	Carbon Steel/Concrete	10'3" x 15' x 2'6"
2M-8	Radiation Shielding Window Shutters, A, B, & C	Carbon Steel	4'0" x 4'0"
2V-32	Extended Reach Master/Slave Manipulator, A & B	Unknown	Unknown
2V-33	Chopped Fuel Basket Loading Station (Note: Original crane was replaced in 1972 [Reference 48, comment by WVNS: P. Burn].)	Unknown	
2V-34	Two-Ton Crane	Unknown	Unknown
2V-35	Chopped Fuel Storage and Cooling Rack	304L Stainless Steel	22'10" x 3' x 8' High
2V-36	Empty Fuel Basket Storage Socket	Unknown	
2V-37	Loaded Fuel Basket Transfer Station Socket	304L Stainless Steel	8" ϕ x 3'0"
2V-38	Leached Hulls Dumping Sampling and Packaging Station	304L Stainless Steel	10' x 7' x 7'
2V-39	Empty Fuel Basket Liner Pallet	304L Stainless Steel	3 section - 8" ϕ x 24"
2V-42	Chopped Fuel Basket Pickup Device	Stainless Steel	8" ϕ x 3'
2V-42A	Chopped Fuel Basket Pickup Device Storage Bracket	304L Stainless Steel	8" x 13" x 1" ϕ
2V-43A	8" Chopped Fuel Basket Liner Pickup Device	SS & CS	8½" x 16"
2V-43B	7" Chopped Fuel Basket Liner Pickup Device	SS & CS	8½" x 16"
2V-43C	6.3" Chopped Fuel Basket Liner Pickup Device	SS & CS	8½" x 16"
2V-43D	Floor-Mounted Storage Stand for Two Liner Pickup Device	304L Stainless Steel	3" Schedule 40
2V-43E	Wall-Mounted Storage Stand One Liner Pickup Device	304L Stainless Steel	¾ ϕ 10" x 12"
2V-47	Power Manipulator Tool and Adapter Holder	Unknown	Unknown

Note: ϕ = diameter

Table 4 (continued)

General Purpose Cell Original Equipment List

Equip. No.	Description	Material	Dimensions
2V-49	Master/Slave Manipulator Tool and Adapter Holder	Unknown	Unknown
2V-52	Leached Hull Basket Transfer Station Socket	304L Stainless Steel	8" ϕ x 3'0"
2V-53	Hinged Sections of Crane Rails	Unknown	2'6" Section Hinged
2V-54	Crane Maintenance Door Operating Unit	Unknown	
2V-55	Power Manipulator-Crane Cable Shield	Unknown	
2V-56	Criticality Guard Rails	Unknown	
2V-57	Bundle Shear Discharge Chute	304L Stainless Steel	10" ϕ x 18'0"
2V-64	Leached Hull Reload Hopper	304L Stainless Steel	8" ϕ x 15"
2V-65	Leached Hull Reload Funnel	304L Stainless Steel	6" ϕ x 17"
2V-66	Packaged Hydraulic Power Unit	Unknown	
2V-67	Fire Protection Packaged Unit	Unknown	
2V-68A	Fire Hose Bracket	Unknown	
2V-68B	Fire Hose Bracket	Unknown	
2V-68C,D	Fire Hose Bracket	Unknown	
2V-69	GPC Mirror Bracket A, B; GPC Bracket only C and D	304L Stainless Steel	2'6"
2V-70	Master Slave Manipulator Plug A, B, C, and D	Unknown	10" x 4'0"
2V-71	Periscope Plug A, B, & C	Unknown	4" ϕ x 4'0"
2V-72	Maintenance Plug A, B, C, D, & E	Unknown	
2V-73	Power Manipulator	Unknown	
2V-74	Cable Tray - Two Ton Crane	Unknown	
2V-75	Chute Adaptor Tip for 8" Baskets	304L Stainless Steel	8" ϕ x 17"

Note: ϕ = diameter

Table 4 (continued)

General Purpose Cell Original Equipment List

Equip. No.	Description	Material	Dimensions
2V-76	Chute Adaptor Tip for 7" Baskets	Unknown	
2V-75A	Tip Storage Stands	Unknown	
2V-77	Chute Adaptor Tip for 6.3" Baskets	Unknown	
2V-77A	Tip Storage Stands	Unknown	
2V-78	Chute Adaptor Tip Change Tools A, B, and C	304L Stainless Steel	¾" bar x 18"
2V-79	Chopped Fuel Basket Liner Pickup		
2V-81A	Settling Tray	304L Stainless Steel	2' x 1' x 3½"
2V-81B	Settling Pan & Eductor Well	Stainless Steel	4" s/40 Pipe 2'1" Long
2V-81C	Permanent Liner-Settling Tray Area	Stainless Steel	3/16" Liner to Accommodate 2V-81A & B
2V-82	Seal Pan	304L Stainless Steel	¼" thick, 15" square by 1⅝" deep
2V-83	Leached Hull Reload Scoop	14 GA 304L Stainless Steel	6" x 9" x 3" high
2V-84	New Fuel Basket Transfer Socket	304L Stainless Steel	Unknown
2V-85A	Liner Capping Device	304L Stainless Steel	9" x 11"
2V-85B	Storage Rack for 2V-85A	304L Stainless Steel	1¼" ϕ with 10" top & bottom plates
2V-85C	Liner Cap Handling Basket	304L Stainless Steel	
2V-86	Scrap Drum Handling Bails	Unknown	
2V-89	Holding Rack for Scrap Drum Lids	304L Stainless Steel	1½" ϕ Pipe with ¾" Bar 18" Long x 3'6" High
2V-85D	Liner Cap Adapter for 8" Basket	304L Stainless Steel	10" ϕ x 3½" Deep

Note: ϕ = diameter

Table 4 (concluded)

General Purpose Cell Original Equipment List

Equip. No.	Description	Material	Dimensions
2V-85E	Liner Cap Adapter for 7" Basket	304L Stainless Steel	10" ϕ x 3½" Deep
2V-85F	Liner Cap Adapter for 6.3" Basket	304L Stainless Steel	10" ϕ x 3½" Deep
3V-21A	Spare Chopped Fuel Basket Pickup Device Storage Bracket	Unknown	
15V-70	Packaged CO_2 Fire Fighting Equipment	Unknown	

Note: ϕ = diameter

Table 5

Analysis of Liquid from the General Purpose Cell Sump

Volatiles	about 100 wt. %[1]
Total U	0.002 g/L
Activities	
Co-60	0.004 - 0.006 μCi/mL
Sr-90	0.7 μCi/mL
Cs-134	0.006 - 0.010 μCi/mL
Cs-137	4 μCi/mL
Pu	0.0006 - 0.0007 μCi/mL
Am-241	Less than detectable

(1) When left exposed in the analytical cells, the sample evaporated to dryness.

(Vance 1986)

Table 6

Miniature Cell Original Equipment List

Equip. No.	Description	Material	Dimensions
11M-1	Viewing Window MC	Oil Filled	3'8" x 3'8" x 3'6"
11M-3	Radiation Shielding Window Shutter, MC	Carbon Steel	4'0" x 4'0"
15M-22	GOA-MC Air Lock Access Door	Carbon Steel	6'8" x 3'1" x 0'6"
15M-29	MC Airlock	304L Stainless Steel	5'6" x 2'6" x 0'¼"
11V-1	One-Ton Hoist and Monorail	Not Found	
11V-5	Transfer Slot GPA to MC	8" Schedule 30-Tube	3'4" Long

Table 7 - Extraction Cell 1 Original Equipment List

Equip. No.	Description	Material	Dimensions	Tank Capacity
4C-1	Partition Cycle Extraction Column	A312 Type 304L	43'1" x 6"	
4C-2	Partition Cycle Partition Column	A312 Type 304L	42'11" x 6"	
4C-3	Partition Cycle Pu Scrub Column	A312 Type 304L	28'0" x 5"	
4C-13A	Partition Cycle Feed Pump Pot	A240 type 304L	4" x 1'6"	
4C-13B	Partition Cycle Feed Pump Pot	A240 Type 304L	4" x 1'6"	
4D-1	Partition Cycle Feed Tank	A240 Type 304L	11' x 6'0"	9084 l (2400 gal)
4D-2	Partition Cycle Waste Catch Tank	A240 Type 304L	6'0"ϕ x 10'6"	8325 l (2200 gal)
7D-1	High-Level Waste Evaporator Feed Tank	A240 Type 304L	6'0"ϕ x 8'0"	6620 l (1750 gal)
4E-1	Column 4C-4 Organic Feed Pre-heater	SS 304L	13'H	
4Y-1	Column 4C-1 Aqueous Decanter	SS 304L	18"ϕ with; 2" ϕ at top	
4Y-5	HAP Surge Pot	SS 304L	8"ϕ x 10'H	
4Y-6	HBU Surge Pot	SS 304L	8"ϕ x 10'H	
4Y-13	Phase Separator for 4D-1	SS 304L	6"ϕ x 1'6"H	
4Y-14	Measuring Head Pot for 4C-1 Feed	SS 304L	6"ϕ x 3'H	
4Y-15	Level Control Pot for 4C-1	SS 304L	6"ϕ x 6'H	
4Y-17	Level Control Pot for 4C-2	SS 304L	6"ϕ x 6'H	
4Y-19	Level Control Pot for 4C-3	SS 304L	6"ϕ x 6'H	
4Y-48	Sample Pot for HCW line	SS 304L		
4Y-49	Sample Pot for 11BW line	SS 304L		
4Y-54	Phase Separator HCW Sampler	SS 304L	6"ϕ x 2'6"T-T	
4Y-56	Phase Separator ICW Sampler	SS 304L		
7Y-1	Phase Separator for 7C-1 Feed	SS 304L	6"ϕ x 2'0"	
7Y-3	Decanter for 7C-1 Feed	A240 Type 304L	14"ϕ x 3'7"	

Note: ϕ = diameter
All equipment is inactive except tank 4D-2.

Table 8 - Extraction Cell 2 Original Equipment List

Equip. No.	Description	Material	Dimension	Capacity
4C-4	Partition Cycle Strip Column	A312 Type 304L	11"ϕ x 42'10"	
4C-7	Plutonium Cycle Extraction Column	A312 Type 304L	5 9/14" ϕ x 43'3"	
4C-8	Plutonium Cycle Strip Column	A312 Type 304L	3½" ϕ x 35'4"	
4C-9	First U Cycle Extraction Column	A312 Type 304L	11" ϕ x 43'3"	
13C-1	No. 1 Carbonate Wash Column	A312 Type 304L	11" ϕ x 28'6"	
13C-2	No. 2 Carbonate Wash Column	A312 Type 304L	11" ϕ x 28'6"	
13C-4	No. 1 Acid Wash Column	A312 Type 304L	1'8" ϕ top 11' ϕ bottom x 15'4"	
13C-5	No. 2 Acid Wash Column	A312 Type 304L	1'8" ϕ top 11' ϕ bottom x 15'4"	
4D-6	Plutonium Cycle Feed Conditioner	A240 Type 304L	2'6" ϕ x 9'3"	
4D-9	First U Cycle Feed Tank Conditioner	A240 Type 304L	3'6" ϕ x 11'11"	1510 l (400 gal)
13D-1	No. 1 Solvent Washer	A240 Type 304L	4' ϕ x 7'9"	1890 l (500 gal)
13D-2	No. 2 Solvent Washer	A240 Type 304L	4' ϕ x 7'9"	1890 l (500 gal)
13D-4	No. 1 Solvent Storage Tank	A240 Type 304L	5' ϕ x 9'8"	3785 l (1000 gal)
13D-5	No. 2 Solvent Storage Tank	A240 Type 304L	5' ϕ x 9'8"	3785 l (1000 gal)
13D-18	Solvent Cleanup & Waste Organic Catch Tank	A240 Type 304L	6'6" ϕ x 10'6"	7570 l (2000 gal)
4E-2	1st U Cycle Strip Feed Heater		2" ϕ x 240"	
4E-4	1st U Cycle Feed Cooler	304L SS	16'4"	
15M-10	XC-2 Access Door	SS 304L	40" x 6" x 82"	
4Y-7	4C-7 Aqueous Decanter	A240 Type 304L	9" ϕ x 5'3"	
4Y-8	4C-8 Aqueous Decanter	A240 Type 304L	5" ϕ x 4'4"	
4Y-9	4C-9 Aqueous Decanter	A240 Type 304L	2" ϕ x 5'9"	

Table 8 - Extraction Cell 2 Original Equipment List (concluded)

Equip. No.	Description	Material	Dimension	Capacity
4Y-20	Level Control Pot for 4C-4	SS 304L	6"ϕ x 6"	
4Y-21	IAU Surge Pot	SS 304L	8"ϕ x 120"	
4Y-24	Measuring Head Pot for 4C-9	A240 Type 304L	6"ϕ x 4'0"	
4Y-25	Level Control Pot for 4C-9	SS 304L	6"ϕ x 6"	
4Y-26	Level Sensing Chamber for 4C-9	SS 304L		
4Y-32	Measuring Head Pot for 4C-7	A240 Type 304L	6" ϕ x 4'0"	
4Y-33	Level Control Pot for 4C-7	SS 304L	2" ϕ x 6"	
4Y-34	Level Sensing Chamber for 4C-7	SS 304L		
4Y-35	Level Control Pot for 4C-8	SS 304L	2" ϕ x 6"	
4Y-40	Organic Extract Head Pot for 4C-7	SS 304L		
4Y-41	Organic Scrub Head Pot for 4C-8	SS 304L		
13Y-1	Phase Separator for 13C-1	SS 304L	2" ϕ x 6"	
13Y-2	Phase Separator for 13D-1	SS 304L	2" ϕ x 6"	
13Y-3	Phase Separator for 13C-2	SS 304L	2" ϕ x 6"	
13Y-4	Phase Separator for 13D-2	SS 304L	2" ϕ x 6"	
13Y-8	Decanter for 13D-18	A240 Type 304L	2' ϕ x 5'11"	
13Y-9	Phase Separator for 13D-18	SS 304L		

Note: ϕ = diameter
All equipment is inactive

Table 9 - Liquid Waste Cell Original Equipment List

Equip. No.	Description	Material	Dimensions	Capacity	Status
3D-2	Condensate Catch Tank	A240 Type 304L	10'10"L x 4'6"ϕ	3,785 l (1000 gal)	Active
4D-8	Plutonium Cycle Waste Catch/Hold Tank	A240 Type 304L	12'10"L x 4'6"ϕ	4,540 l (1200 gal)	Inactive
4D-10	First U Cycle Waste Catch Tank	A240 Type 304L	15'3"L x 9'0"ϕ	22,710 l (6000 gal)	Inactive
4D-13	Second U Cycle Waste Catch Tank	A240 Type 304L	15'3"L x 9'0"ϕ	22,710 l (6000 gal)	Inactive
7D-2	Low Level Waste Evaporator Feed Tank	A240 Type 304L	24'0"L x 8'0"ϕ	32,170 l (8500 gal)	Active
7D-8	Rework Evaporator Feed Tank	A240 Type 304L	13'2"L x 7'0"ϕ	11,355 l (3000 gal)	Inactive
7D-14	Hot Analytical Cell Drain Catch Tank	B334 Haselloy C	9'2"L x 3'6"ϕ	1,890 l (500 gal)	Active
13D-7	Solvent Waste Catch Tank	A240 Type 304L	17'10"L x 3'7"ϕ	3,785 l (1000 gal)	Inactive
13D-8	Solvent Waste Hold Tank	A240 Type 304L	17'10"L x 3'7"ϕ	3,785 l (1000 gal)	Active

ϕ = diameter

Table 10

Acid Recovery Cell Original Equipment List

Equip. No.	Description	Material	Capacity	Status
7C-3	Acid Fractionator	A240 Type 304L		Inactive
7C-5	General Purpose Evaporator	A240 Type 304L		Inactive
7D-3	Acid Fractionator Feed Tank	A240 Type 304L	7570 liters (2000 gal)	Inactive
7E-1	Acid Fractionator Feed Vaporizer	A240 Type 304L		Inactive
7E-2	Acid Fractionator Reboiler	A240 Type 304L		Inactive
7E-11	Vaporizer Bottoms Cooler	A240 Type 304L		Inactive
7E-12	Acid Fractionator Bottoms Cooler	A240 Type 304L		Inactive
7E-13	General Purpose Evaporator Condenser	A240 Type 304L		Inactive
7E-14	General Purpose Evaporator Reboiler	A240 Type 304L		Inactive

Table 11

Acid Recovery Pump Room Original Equipment List

Equip. No.	Description	Material	Capacity	Status
7D-6	Weak Acid Catch Tank	A240 Type 304L	1325 liters (350 gal)	Inactive
7G-1	Weak Acid Pump	A240 Type 304L		Inactive
7G-1A	Weak Acid Pump (spare)	A240 Type 304L		Inactive
7G-5	Fractionator Bottoms Pump	A240 Type 304L		Inactive
7G-10	Vaporizer Bottoms Pump	A240 Type 304L		Inactive
7G-14	Weak Acid Sample Pump	A240 Type 304L		Inactive

Table 12

Hot Acid Cell Original Equipment List

Equip. No.	Description	Material	Dimensions	Capacity	Status
7D-11	Hot Acid Storage Tank	A240 Type 304L	6'6" ϕ x 14'4" long	12,100 liters (3,200 gal)	Inactive
7D-12	Hot Acid Batch Tank	A240 Type 304L	5'0" ϕ x 14'0" long	6,800 liters (1,800 gal)	Inactive
7G-3	Hot Acid Pump	Stainless Steel	Not Found		Inactive

Note: ϕ = diameter

Table 13

Off-Gas Cell Original Equipment List

Equip. No.	Description	Material	Capacity	Status
6D-3	Vessel Off-Gas Condensate Catch Tank	A240 Type 304L	910 liter (240 gal)	Active
6C-1	Dissolver Off-Gas Silver Reactor	A240 Type 304L		Inactive
6C-1A	Dissolver Off-Gas Silver Reactor	A240 Type 304L		Inactive
6C-3	Vessel Off-Gas Scrubber	A240 Type 304L		Active
6C-6	Dissolver Off-Gas Scrubber	A240 Type 304L		Inactive
6E-1	Dissolver Off-Gas Heater	A240 Type 304L		Inactive
6E-2	Dissolver Off-Gas Cooler	A240 Type 304L		Inactive
6E-3	Vessel Off-Gas Condenser	A240 Type 304L		Active
6E-4	Vessel Off-Gas Heater	A240 Type 304L		Active
7E-7	Low-level Waste Evaporator Condenser	A240 Type 304L		Inactive

Table 14 - Off-gas Blower Room Original Equipment List

Equip. No.	Description	Material	Dimensions	Status
15T-66	Trolley for OGBR	Unknown	Unknown	Active
15T-64	Hoist Trolley for OGBR	Unknown	Unknown	Removed
15T-65	Monorail Trolley for OGBR	Unknown	Unknown	Active
6K-1	Dissolver Off-Gas Blower	304L Stainless Steel	Unknown	Removed
6K-1A	Dissolver Off-Gas Blower	304L Stainless Steel	Unknown	Removed
6K-2	Vessel Off-Gas Blower	304L Stainless Steel	Unknown	Active
6K-2A	Vessel Off-Gas Blower	304L Stainless Steel	Unknown	Active
6T-1	Dissolver Off-Gas Filter	304L Stainless Steel	28" O.D. x 20" High	Removed
6T-1A	Dissolver Off-Gas Filter	304L Stainless Steel	28" O.D. x 20" High	Removed
6T-2	Vessel Off-Gas Filter	304L Stainless Steel	28" O.D. x 20" High	Active
6T-2A	Vessel Off-Gas Filter	304L Stainless Steel	28" O.D. x 20" High	Active

Note: O.D. - outside diameter

APPENDIX A

Low Pour 150 Oil

SENT BY:520 MADISON AVE. NY ; 3-12-90 ;12:30PM ;

Witco MATERIAL SAFETY DATA SHEET

PRODUCT Low Pour 150 Oil (Freezene 150)

HAZARD RATING (NFPA)	
4 – EXTREME	Fire: 1
3 – HIGH	Reactivity: 0
2 – MODERATE	Toxicity: 0
1 – SLIGHT	Special: 0
0 – INSIGNIFICANT	

SECTION I

WITCO MANUFACTURING DIVISION OR SUBSIDIARY
1 Sonneborn Division

EMERGENCY TELEPHONE (504) 366-7281
MANUFACTURER (412) 756-2210
CHEM TREC 1-(800) 424-9300

ADDRESS (NUMBER, STREET, CITY, STATE, ZIP CODE)
2 P.O. Box 336, Petrolia, PA. 16050 — P.O. Box 308 Gretna, LA. 70054

CHEMICAL NAME OR FAMILY
3 White Mineral Oil, NF

FORMULA
4 A mix of liquid hydrocarbons refined from petroleum.

SECTION II – CHEMICAL AND PHYSICAL PROPERTIES

CHEMICAL

HAZARDOUS DECOMPOSITION PRODUCTS
5 Upon combustion, CO_2 and CO are generated.

INCOMPATIBILITY (KEEP AWAY FROM)
6 Keep away from flame, heat (150°F max.), and strong oxidizing agents.

LIST ALL TOXIC AND HAZARDOUS INGREDIENTS
7 None

PHYSICAL

No.	Property	Value
8	FORM	Viscous liquid
9	ODOR	None
10	APPEARANCE	Colorless liquid
11	COLOR	None
12	SPECIFIC GRAVITY (WATER = 1)	<1.0 @ 15°C
13	BOILING PT. IBP	> 230 °C; > 450 °F
14	MELTING PT.	NA °C; NA °F
15	SOLUBILITY IN WATER AT 25 °C	Negligible
16	% VOLATILE (BY WT %)	Nil @ 25°C
17	EVAP. RATE (= 1)	Nil @ 25°C
18	VAPOR PRESSURE (mm Hg at 20 °C)	< .5mm
19	VAPOR DENSITY (AIR = 1)	NA
20	pH AS IS / pH ( )	NA

21 STRONG ACID ☐ STRONG BASE ☐ STABLE ☒ UNSTABLE ☐

22 VISCOSITY SUS AT 100 °F: <100 ☐ 100 OR > ☒

23 CAS #8042-47-5

SECTION III – FIRE AND EXPLOSION DATA

SPECIAL FIRE FIGHTING PROCEDURES
24 Self-contained breathing apparatus is recommended for firefighters. Water-spray must be used with caution to prevent spread of flames.

FLASH POINT (METHOD USED)
26 ASTM D-92 > 176 °C > 350 °F

FLAMMABLE LIMITS %
27 NDA LOWER ____ UPPER ____

UNUSUAL FIRE AND EXPLOSION HAZARDS
25 None

EXTINGUISHING AGENTS
28 ☒ DRY CHEMICAL ☒ CO_2 ☒ WATERSPRAY ☒ FOAM ☒ WATERFOG ☒ SAND/EARTH ☐ OTHER ____

SECTION IV – HEALTH HAZARD DATA

PERMISSIBLE CONCENTRATIONS (AIR)
29 See Section IX - COMMENTS.

EFFECTS OF OVEREXPOSURE
30 NDA

TOXICOLOGICAL PROPERTIES
31 NDA

EMERGENCY FIRST AID PROCEDURES
32 EYES - Flush with water. If irritation exists consult a physician.
33 SKIN CONTACT - NA
34 INHALATION - NA
35 IF SWALLOWED - Call a physician.

NA = NOT APPLICABLE NDA = NO DATA AVAILABLE < = LESS THAN > = MORE THAN

Witco MATERIAL SAFETY DATA SHEET

PRODUCT Low Pour 150 Oil (Freezene 150)

SECTION V — SPECIAL PROTECTION INFORMATION

VENTILATION TYPE REQUIRED (LOCAL, MECHANICAL, SPECIAL) [36] NA	PROTECTIVE GLOVES [38] None
	EYE PROTECTION [39] Chemical splash goggles
RESPIRATORY PROTECTION (SPECIFY TYPE) [37] NA	OTHER PROTECTIVE EQUIPMENT [40] None

SECTION VI — HANDLING OF SPILLS OR LEAKS

PROCEDURES FOR CLEAN-UP [41]

Shut off leak, dike up spills, absorb with inert material such as sand, earth or vermiculite. Sweep up and dispose of in accordance with Federal, State and local regulations.

WASTE DISPOSAL [42]

Use methods consistent with Federal, State and local regulations.

SECTION VII — SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE [43]

Avoid heat (150°F max.), flame and oxidizing agents.

SECTION VIII — TRANSPORTATION DATA

[44] UNREGULATED BY D.O.T. [X]	U.S. D.O.T. PROPER SHIPPING NAME [47] NA		
[45] REGULATED BY D.O.T [ ]	U.S. D.O.T. HAZARD CLASS [48] NA		I.D. NUMBER [49] NA
[46] TRANSPORTATION EMERGENCY INFORMATION CHEM TREC 1-(800) 424-9300	RQ [50] NA	LABEL(S) REQUIRED [51] NA	
	FREIGHT CLASSIFICATION [52] Petroleum Oil NOIBN		
	SPECIAL TRANSPORTATION NOTES [53] NA		

SECTION IX — COMMENTS

[54] This product is a fully refined white mineral oil meeting the requirements of the National Formulary XVII as well as the requirements of the Food and Drug Administration as per CFR 172.878. If used in applications where a mist may be generated, observe a TWA/PEL of 5 mg/m^3 of mineral oil mist (OSHA and ACGIH).

Tel: (212) 605-3911

SIGNATURE Alexander Coutras TITLE Manager, Regulatory Affairs

REVISION DATE Jan. 9, 1990 SENT TO ATTN: ____ DATE ____

SUPERSEDES Dec. 1, 1989

We believe the statements, technical information and recommendations contained herein are reliable, but they are given without warranty or guarantee of any kind, express or implied, and we assume no responsibility for any loss, damage, or expense, direct or consequential, arising out of their use.

HOT CELL SERVICES CORPORATION
MATERIAL SAFETY DATA SHEET

WHITE MINERAL OIL, USP/NF — REVISION OF: 06/01/92

HOT CELL SERVICES CORPORATION
22626 85TH PLACE SOUTH
KENT, WASHINGTON 98031
(206) 854-4945

------------------------------EMERGENCY ASSISTANCE---------------------------

FOR EMERGENCY ASSISTANCE CALL (206) 854-4945

PO# 50384N-EX AR# 48

****

PRODUCT IDENTIFICATION

[√] APPROVED
[ ] APPROVED WITH COMMENTS
[ ] DISAPPROVED
[ ] RECEIPT ACKNOWLEDGED

SIGNED Rawlings 10/8/92
COGNIZANT ENGINEER

****

PRODUCT NAME: White Mineral Oil, USP/NF

COMMON NAMES/SYNONYMS: Sontex, Drakeoil, Parol, Peneteck, Arcoprime (TM), Amoco White Oil No. 8-T, 6970 Penreco, 5, White Blandol, Mineral Oil NF70, Clantex Resi-dew Oil, Super Crease NIB Oil. Kaydol (R)

FORMULA: Undefined — DATE ISSUED: 06/92

MOLECULAR WEIGHT: *NAP — SUPERCEDES: 05/91

****
EMERGENCY OVERVIEW
****

HAZARD RATING SCALE

NFPA RATING (Manufacturer)		HMIS HAZARD RATING	
HEALTH:	0	HEALTH:	1
FIRE:	1	FIRE:	1

HOT CELL SERVICES CORPORATION
MATERIAL SAFETY DATA SHEET

White Mineral Oil, USP/NF REVISION OF: 06/01/92

HOT CELL SERVICES CORPORATION (206) 854-4945
22626 85TH PLACE SOUTH
KENT, WASHINGTON 98031

REACTIVITY: 0
SPECIAL: None

0 = MINIMAL 3 = SERIOUS
1 = SLIGHT 4 = SEVERE
2 = MODERATE

REACTIVITY: 0

Protective equipment can only be assigned on a case-by-case basis.

****

HAZARDOUS INGREDIENTS

****

COMPONENT	Cas No.	% Wt.	EXPOSURE LIMITS, PPM OSHA PEL	ACGIH TLV	OTHER LIMIT	HAZARD
Mineral Oil	8042-47-5	>99	None	5mg/m3 mist	None	None

(TM) Trademark of Arco Petroleum Products Company.

(R) Trademark of Witco.

****

HEALTH HAZARD INFORMATION

****

PRIMARY ROUTES OF EXPOSURE: Skin or eye contact, inhalation.

SIGNS AND SYMPTOMS OF EXPOSURE

INHALATION: None currently known.

EYE CONTACT: None currently known.

SKIN CONTACT: None currently known.

SWALLOWED: May act as a laxative.

CHRONIC EFFECTS OF EXPOSURE: No specific information available.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: None reported.

HOT CELL SERVICES CORPORATION
MATERIAL SAFETY DATA SHEET

White Mineral Oil, USP/NF — REVISION OF: 06/01/92

HOT CELL SERVICES CORPORATION — (206) 854-4945
22626 85TH PLACE SOUTH
KENT, WASHINGTON 98031

FIRST AID MEASURES

IF INHALED: Remove to fresh air. Give artificial respiration if not breathing. Get immediate medical attention.

IN CASE OF EYE CONTACT: Immediately flush eyes with lots of running water for 15 minutes, lifting the upper and lower eyelids occasionally. Get immediate medical attention.

IN CASE OF SKIN CONTACT: Immediately wash skin with lots of soap and water. Remove contaminated clothing and shoes; wash before reuse. Get medical attention if irritation persists after washing.

IF SWALLOWED: Do not induce vomiting. If conscious, give lots of water or milk. Get immediate medical attention. Do not give anything by mouth to an unconscious or convulsing person.

Notes to Physician: None

FIRE AND EXPLOSION INFORMATION

FLASH POINT, DEG. F: >280
METHOD USED: COC

FLAMMABLE LIMIT
VEL: *NDA LEL: NDA

AUTOIGNITION TEMPERATURE: NDA

EXTINGUISHING MEDIA: Use dry chemical CO2 or alcohol foam. Do not use water to fight fire.

SPECIAL FIRE FIGHTING PROCEDURES: Fire-fighter should wear self-contained breathing apparatus and full protective clothing. Use water spray to cool nearby containers and structures exposed to fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: None

HOT CELL SERVICES CORPORATION
MATERIAL SAFETY DATA SHEET

White Mineral Oil, USP/NF REVISION OF: 06/01/92

HOT CELL SERVICES CORPORATION (206) 854-4945
22626 85TH PLACE SOUTH
KENT, WASHINGTON 98031

****

HAZARDOUS REACTIVITY

****

STABILITY: Stable POLYMERIZATION: Will not occur

CONDITIONS TO AVOID: None

MATERIALS TO AVOID: Oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: May liberate carbon monoxide or carbon dioxide.

****

SPILL, LEAK, AND DISPOSAL PROCEDURES

****

ACTION TO TAKE FOR SPILLS OR LEAKS: Wear protective equipment including rubber boots, rubber gloves, rubber apron, and a self-contained breathing apparatus in the pressure demand mode or a supplied-air respirator. If the spill or leak is small, a full face piece air-purifying cartridge respirator equipped for organic vapors may be satisfactory. In any event, always wear eye protection. For small spills or drips, mop or wipe up and dispose of in DOT-approved waste containers. For large spills, contain by diking with soil or other non-combustible absorbent materials, and then pump into DOT-approved waste containers, or absorb with non-combustible sorbent material, place residue in DOT-approved waste containers. Keep out of sewer storm drains, surface waters, and soil.

Comply with all applicable governmental regulations on spill reporting, and handling and disposal of waste.

DISPOSAL METHODS: Dispose of contaminated product and materials used in cleaning up spills or leaks in a manner approved for this material. Consult appropriate Federal, State and Local regulatory agencies to ascertain proper disposal procedures.

HOT CELL SERVICES CORPORATION
MATERIAL SAFETY DATA SHEET

White Mineral Oil, USP/NF — REVISION OF: 06/01/92

HOT CELL SERVICES CORPORATION (206) 854-4945
22626 85TH PLACE SOUTH
KENT, WASHINGTON 98031

NOTE: Empty containers can have residues, gases and mists and are subject to proper waste disposal, as above.

****

PERSONAL PROTECTION

****

VENTILATION: General room ventilation.

RESPIRATORY PROTECTION: If use conditions generate vapors or mists, wear a NIOSH-approved respirator appropriate for those emission levels. Appropriate respirators may be a full-face piece or a half-mask air-purifying cartridge respirator equipped for organic vapors/mists, a self-contained breathing apparatus in the pressure demand mode, or a supplied-air respirator.

EYE PROTECTION: Chemical goggles and full face shield unless a full-face piece respirator is also worn. It is generally recognized that contact lenses should not be worn when working with chemicals because contact lenses may contribute to the severity of an eye injury.

PROTECTIVE CLOTHING: Long-sleeved shirt, trousers, safety shoes, rubber gloves and rubber apron.

OTHER PROTECTIVE MEASURES: An eyewash and safety shower should be nearby and ready for use.

****

SPECIAL PRECAUTIONS

****

STORAGE AND HANDLING PRECAUTIONS: Store in a cool, dry, well-ventilated place away from incompatible materials. Keep container tightly closed when not in use. Do not use pressure to empty container. Wash thoroughly after handling. Do not get in eyes, on skin, or on clothing. Keep away from heat sparks, open flame or oxidizers.

REPAIR AND MAINTENANCE PRECAUTIONS: None

OTHER PRECAUTIONS: This product is intended for use in food, animal feed,

HOT CELL SERVICES CORPORATION
MATERIAL SAFETY DATA SHEET

White Mineral Oil, USP/NF REVISION OF: 06/01/92

HOT CELL SERVICES CORPORATION (206) 854-4945
22626 85TH PLACE SOUTH
KENT, WASHINGTON 98031

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drug or cosmetic manufacture and it has been produced and packaged in accordance with strict quality practices. Maintain this quality level by storing this product away from other chemicals, handling it with care, and avoiding all sources of contamination.

Containers, even those that have been emptied, will retain product residue and vapors. Always obey hazard warning and handle empty containers as if they were full.

****

PHYSICAL PROPERTIES

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BOILING POINT, DEG F.: IBP >540

MELTING POINT, DEG F.: NDA

SPECIFIC GRAVITY (WATER = 1): 0.82 - 0.88 pH: NDA

VAPOR PRESSURE mm Hg/20 deg. C: <1 WATER SOLUBILITY %: Insoluble

VAPOR DENSITY (AIR = 1): NDA

EVAPORATION RATE (BUTYL ACETATE = 1): <1

% VOLATILE (by VOLUME): 0

APPEARANCE AND ODOR: Clear, transparent liquid, odorless.

****

TOXICITY DATA

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ORAL: (Rats) LD50 = 5 g/kg

DERMAL: (Rabbit) LD50 = 2 g/kg

INHALATION: NDA

HOT CELL SERVICES CORPORATION
MATERIAL SAFETY DATA SHEET

White Mineral Oil, USP/NF REVISION OF: 06/01/92

HOT CELL SERVICES CORPORATION
22626 85TH PLACE SOUTH
KENT, WASHINGTON 98031
(206) 854-4945

CARCINOGENICITY: This material is not considered to be a carcinogen by the National Toxicology Program, the International Agency for Research on Cancer or OSHA.

OTHER DATA: None

****

OTHER REGULATORY INFORMATION

****

SECTION 313: NONE

PROPOSITION 65: NONE

SECTION 313 & PROP. 65: NONE

SECTION 313 (WITH CHEMICALS LISTED): NONE

PROPOSITION 65 (WITH CHEMICALS LISTED): NONE

MASSACHUSETTS: NONE

PENNSYLVANIA: NONE

CALIFORNIA SCAQMD:

VOC: NDA VAPOR PRESSURE: <1mm Hg @ 70F

TSCA: The ingredients of this product are on the TSCA inventory.

HOT CELL SERVICES CORPORATION
MATERIAL SAFETY DATA SHEET

White Mineral Oil, USP/NF REVISION OF: 06/01/92

HOT CELL SERVICES CORPORATION (206) 854-4945
22626 85TH PLACE SOUTH
KENT, WASHINGTON 98031

****

REVISIONS

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01/90 Added synonyms, HMIS Hazard Rating, autoignition temp, pH, % volatile, Ecological Information, VOC, Vapor Pressure, TSCA.

02/90 Added synonym.

02/91 Added synonym, trademark.

*NDA No Data Available
*NAP Not Applicable

Radiacwash

Material Safety Data Sheet

May be used to comply with OSHA's Hazard Communication Standard, CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List): Radiacwash

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name: Atomic Products Corp.	Emergency Telephone Number: (516) 924-9000
Address (Number, Street, City, State, and ZIP Code): 49 Natcon Drive	Telephone Number for Information: (516) 924-9000
Shirley, N 11967	Date Prepared: 2/22/88
	Signature of Preparer (optional): W. S. Gilman

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
1) Citric Acid	---	---		
2) Octyl Phenol Condensed with 8 - 10 moles Ethylene Oxide, Triton X100	CAS 9036195			
3) Tetrasodium Ethylenediamine Triacetate	CAS 15708415			
4) Benzyldimethyl (2-(2-(P- (1,1,3,3, tetra-methylbutyl) Phenoxy) Ethoxy) Ethyl) Ammonium Chloride, Hyamine 1622	CAS 121540			

Section III — Physical/Chemical Characteristics

Boiling Point	100°C	Specific Gravity (H_2O = 1)	1.052
Vapor Pressure (mm Hg.)	NA	Melting Point: Freezing Point	0.3°C
Vapor Density (AIR = 1)	NA	Evaporation Rate (water = 1)	1.2

Solubility in Water: Infinite (completely miscible)

Appearance and Odor: Bluish transparent liquid - slightly pungent odor

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits	LEL	UEL
Greater than 214°F	NA		

Extinguishing Media: Dry powder, foam, carbon dioxide

Special Fire Fighting Procedures: Fire fighters should wear self-contained breathing apparatus.

Unusual Fire and Explosion Hazards: Decomposition products may be toxic.

(Reproduce locally) OSHA 174, Sept. 1985

Section V — Reactivity Data

Stability			Conditions to Avoid
	Unstable		
	Stable	X	Metal nitrates

Incompatibility (Materials to Avoid): Metallic surfaces for prolonged time periods (pH 5)

Hazardous Decomposition or Byproducts:

Hazardous Polymerization			Conditions to Avoid
	May Occur		
	Will Not Occur	X	None

Section VI — Health Hazard Data

Route(s) of Entry: Inhalation? No Skin? Yes Ingestion? Yes

Health Hazards (Acute and Chronic): Prolonged contact of product with skin may cause irritation, possible allergic reaction.

Oral toxicity is low - LD50 Rate = >800 mg/kg

Carcinogenicity: NTP? None IARC Monographs? None OSHA Regulated? None

Signs and Symptoms of Exposure: Repeated contact with skin may cause drying of skin and moderate irritation.

Some allergic properties experienced.

Medical Conditions Generally Aggravated by Exposure: Pre-existing eye, skin and respiratory disorders may be aggravated by exposure to product.

Emergency and First Aid Procedures: Inhalation: Remove to fresh air, Eyes: Flush with water for at least 15 minutes.

Skin: Wash thoroughly with soap and water, Ingestion: Drink plenty of water, call physician

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled: Soak up material with absorbant materials and place in tight container.

Waste Disposal Method: Place in appropriate disposal facility in compliance with Federal, State and Local regulations.

Precautions to Be Taken in Handling and Storing: Store in closed containers away from heat.

Other Precautions: None

Section VIII — Control Measures

Respiratory Protection (Specify Type): Wear NIOSH approved respirator if required

Ventilation		
Local Exhaust: In open areas	Special: None
Mechanical (General): In confined areas	Other: None

Protective Gloves: Impervious gloves Eye Protection: Goggles

Other Protective Clothing or Equipment: Barrier creams, aprons, overalls to avoid contact.

Work/Hygienic Practices: Observe conditions of good industrial hygiene - no eating, smoking or drinking.

Chemclean No. 128

ID # 00704

Material Safety Data Sheet
May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List): Chemclean No. 128

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufacturer's Name: Chemclean Corp.	Emergency Telephone Number
Address (Number, Street, City, State, and ZIP Code): 130-45 180 St.	Telephone Number for Information
Springfield Gdns. N.Y.	Date Prepared
	Signature of Preparer (optional)

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity, Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
None				

Section III — Physical/Chemical Characteristics

Boiling Point	215 °F	Specific Gravity (H_2O = 1)	1
Vapor Pressure (mm Hg)	N/A	Melting Point	N/A
Vapor Density (AIR = 1)	N/A	Evaporation Rate (Butyl Acetate = 1)	As Water

Solubility in Water: Complete

Appearance and Odor: Clear liquid with detergent odor.

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used): None	Flammable Limits: None	LFL: --	UEL: --

Extinguishing Media: N/A

Special Fire Fighting Procedures: None

Unusual Fire and Explosion Hazards: None

Section V — Reactivity Data

Stability	Unstable		Conditions to Avoid: None
	Stable	X	
Incompatibility (Materials to Avoid)	Strong oxidants		
Hazardous Decomposition or Byproducts	Carbon dioxide or oxides of nitrogen		
Hazardous Polymerization	May Occur		Conditions to Avoid: None
	Will Not Occur	X	

Section VI — Health Hazard Data

Route(s) of Entry: Inhalation? Skin? Ingestion?

Health Hazards (Acute and Chronic): Nonn Known - prolonged contact may defat skin.

Carcinogenicity: NTP? No IARC Monographs? No OSHA Regulated? No

Signs and Symptoms of Exposure: Redening of skin.

Medical Conditions Generally Aggravated by Exposure: None known

Emergency and First Aid Procedures: Wash with copious amounts of water. If skin or eye irritation persists see doctor.

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled: Material is biodegradable - wash to senitary sewer or absorb and dispose of to landfill.

Waste Disposal Method: Rinse down or absorb and landfill in approved location.

Precautions to Be Taken in Handling and Storing: None - Keep from freezing.

Other Precautions: None

Section VIII — Control Measures

Respiratory Protection (Specify Type): Not needed

Ventilation	Local Exhaust	No	Special	N/A
	Mechanical (General)	No	Other	N/A
Protective Gloves	Plastic or rubber		Eye Protection	Goggles for concentrate

Turco Fabrifilm Remover

TURCO MATERIAL SAFETY DATA SHEET

TURCO FABRIFILM REMOVER

Date: 07/13/92

CS No.: 01750
Page 1 of 4

SECTION I MANUFACTURER'S NAME AND ADDRESS

Manufacturer's Name: TURCO PRODUCTS, INC.
DIVISION OF ATOCHEM NORTH AMERICA
Address: 7300 BOLSA AVENUE
WESTMINSTER, CA 92684
Emergency telephone: (614) 387-6200
For information: (714) 890-3600

SECTION II HAZARD INFORMATION

THE FOLLOWING INGREDIENTS ARE DEFINED TO BE HAZARDOUS PER 29CFR 1910-1200:

NAME (CAS)	CERCLA RQ	RCRA NO	SARA REPORTABLE	%
2-BUTOXYETHANOL (111-76-2)	NOT LISTED	NOT LISTED	YES	<5
ACGIH TLV: 25 ppm (skin)				
OSHA PEL: 25 ppm (skin)				
HEXYLENE GLYCOL (107-41-5)	NOT LISTED	NOT LISTED	NO	<5
ACGIH TLV: C 25 ppm				
OSHA PEL: C 25 ppm				
SODIUM DODECYLBENZENE SULFONATE (25155-30-0)	1000	NOT LISTED	NO	<5
ACGIH TLV: NOT ESTABLISHED				
OSHA PEL: NOT ESTABLISHED				
NONYLPHENOXYPOLY(ETHYLENEOXY)ETHANOL (9016-45-9)	NOT LISTED	NOT LISTED	NO	<5
ACGIH TLV: NOT ESTABLISHED				
OSHA PEL: NOT ESTABLISHED				
AMMONIUM HYDROXIDE (AMMONIA) (1336-21-6)	1000	NOT LISTED	NO	<5
ACGIH TLV: 25 ppm				
OSHA PEL: 35 ppm (STEL)				

THE FOLLOWING INGREDIENTS ARE NOT REQUIRED TO BE LISTED BY 29CFR 1910-1200, BUT ARE LISTED IN CONFORMANCE WITH THE 'RIGHT-TO-KNOW' LAWS OF CERTAIN STATES, INCLUDING PENNSYLVANIA AND NEW JERSEY:

WATER (7732-18-5)

THE FOLLOWING INGREDIENTS ARE LISTED IN COMPLIANCE WITH 29CFR 1910-1200,APPENDIX A(1):

HEXAVALENT CHROMIUM COMPOUNDS (as Cr): 0.03%
IARC: CARCINOGENIC TO HUMANS (GROUP 1)
NTP: KNOWN TO BE CARCINOGENIC (GROUP A)

DOT INFORMATION
:OPER SHIPPING NAME: RQ ORM-E, liquid, n.o.s.
(Sodium chromate, Ammonium hydroxide)
.Z CLASS: ORM-E ID NUMBER: NA9188

****

SECTION III PHYSICAL PROPERTIES (TYPICAL)

Boiling point: Approx. 212 deg. F. Specific gravity: 1.01
Vapor pressure: Approx. 25mmHg Volatile, % by volume: Approx. 90%
SCAQMD VOC: 25 g/l.(calculated from nominal composition)
Vapor density: >1 (air=1) Evaporation rate: <1 (BuAc=1)
Solubility in water: Complete pH: Concentrated 12.0
Appearance and odor:
Viscous yellow liquid - ammoniacal odor

****

SECTION IV - FIRE AND EXPLOSION HAZARDS:

FLASH POINT AND METHOD USED:
Nonflammable - Not applicable

EXTINGUISHING MEDIA:
Not applicable
SPECIAL FIRE FIGHTING PROCEDURE AND PRECAUTIONS:
Use self-contained respiratory protection. Any water runoff may contain hexavalent chrome and should not be allowed to enter sewer or waterways.
UNUSUAL FIRE AND EXPLOSION HAZARDS:
None

****

SECTION V - HEALTH AND EMERGENCY INFORMATION:

EFFECTS OF OVER-EXPOSURE: EYES:
Contact with eyes may cause moderate to severe irritation, possible burns.
SKIN:
Contact with skin may cause moderate to severe irritation.
INHALATION:
Inhalation of chromate-containing mist may cause severe irritation and possible permanent damage to upper respiratory tract and may cause lung cancer risk.
INGESTION:
Moderate to severe irritation of gastrointestinal tract. May be harmful if swallowed. Toxic effects may not appear immediately.
MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED:
2-butoxyethanol is readily absorbed through the skin where it exerts a toxic effect on the kidney, liver and blood-forming system. Repeated overexposure may aggravate preexisting dysfunction of these systems.

****

SECTION VA - FIRST AID INFORMATION:

FIRST AID: EYES:
Flush eyes with large volumes of water for at least 15 minutes. If irritation persists, obtain medical attention.

SKIN:
Speed is essential. Flush affected area with large volumes of water. Wash with soap and water. Rinse thoroughly. If irritation is evident or blistering occurs, obtain medical attention.
INHALATION:
Remove to fresh air. Administer oxygen if breathing is difficult. Obtain medical attention if irritation persists.
INGESTION:
Do not induce vomiting except on advice of competent medical personnel. If victim is conscious, dilute by giving large volumes of milk or water. Obtain immediate medical attention. Never attempt to induce vomiting or give anything by mouth to an unconscious person.
PRIMARY ROUTES OF ENTRY ARE INHALATION AND SKIN CONTACT.

****

SECTION VI - REACTIVITY DATA:

STABILITY: STABLE
CONDITIONS TO AVOID:
Contact with strong acid, strong caustic, strong oxidizing agents
HAZARDOUS DECOMPOSITION PRODUCTS:
None

****

SECTION VII - SPILL, LEAK AND DISPOSAL PROCEDURE:

SPILL OR RELEASE PROCEDURE: CONCENTRATE
Contain spillage. Stop leak at source if this can be done safely. Ventilate area. Nonessential personnel should leave the area until cleanup is completed. Pump liquid into DOT-approved drums for disposal. Absorb remaining liquid onto inert absorbent and place in DOT-approved drums for disposal. Wash area with water. Collect washings and place in DOT-approved drums for disposal. Keep concentrate and wash water from entering sewers or waterways.
USE SOLUTION:
As for concentrate, if applicable.
DISPOSAL INFORMATION: CONCENTRATE:
(1) Transfer to reclaiming center for recycling or reuse, if possible.
(2) Transfer to licensed hazardous waste treatment or disposal site for disposition under applicable local, state and regional regulations as hazardous waste.
SPENT SOLUTION AND RINSES:
Dispose per (1) or (2) above. Treat rinse water as hazardous waste. Remove chromate by reduction and precipitation. Remove organics by oxidation and carbon treatment. Clarified rinse water may be released to sewer if local regulations permit. Precipitated sludge from chromate reduction must be collected and disposed as hazardous waste.

****

SECTION VIII - SPECIAL PROTECTION INFORMATION:

RESPIRATORY PROTECTION:
For mist conditions, a NIOSH-approved respirator for toxic dusts and mists is advised. If respirators are used, a formal training and screening program must be initiated. See 29 CFR 1910-134.

VENTILATION:
Maintain sufficient mechanical ventilation to keep vapor concentration below TLV.

PROTECTIVE EQUIPMENT:
Protective equipment: Face shield or goggles, gloves, boots and apron made of neoprene or other impervious material. Protective suit not normally required, but advised if necessary to avoid prolonged or repeated skin contact or other exposure.

RECOMMENDED PERSONAL HYGIENE
Wash hands and face with soap and water before smoking or eating. Immediately remove all contaminated clothing. Launder separately before reuse. Discard shoes that become contaminated on the interior.

****

SECTION IX - OTHER INFORMATION:

SPECIAL PRECAUTIONS - STORAGE AND HANDLING:
Store in dry protected area away from strong oxidizing agents, or strong acids. Note on 2-butoxyethanol: Inhalation birth defect studies have been conducted with 2-butoxyethanol in rats at relatively high doses (200 and 300 ppm respectively). Although some toxic effects were noted in either the developing embryo or fetus in two of these studies, they were considered to be secondary to toxic effects in the mother. Another study in rabbits at 200 ppm showed similar results. No birth defects were reported in any of these studies.

MIXING:
Carefully add to water while mixing, taking care to avoid splashing. Use appropriate safety equipment to eliminate possibility of skin or eye contact. Make additions to in-use tanks slowly and cautiously.

REPAIR AND MAINTENANCE OF CONTAMINATED EQUIPMENT:
Relieve any pressure. Cover openings to avoid spurting. Clean exterior and interior by flushing with water. Collect flushings for disposal. Use protective equipment for eyes, skin and inhalation.

****

CHECKED BY: John P. Jones, Research Manager
APPROVED BY: John F. Grainger, Director Tech. Serv.
DATE PREPARED: 04/30/92 DATE PRINTED: 07/13/92 FILE NO: 3133.069/0

TURCO 4497-66

TURCO MATERIAL SAFETY DATA SHEET

TURCO 4497-66

CS No.: 03756

Date: 07/13/92

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SECTION I MANUFACTURER'S NAME AND ADDRESS

Manufacturer's Name: TURCO PRODUCTS, INC.
DIVISION OF ATOCHEM NORTH AMERICA
Address: 7300 BOLSA AVENUE
WESTMINSTER, CA 92684
Emergency telephone: (614) 387-6200
For information: (714) 890-3600

****

SECTION II HAZARD INFORMATION

THE FOLLOWING INGREDIENTS ARE DEFINED TO BE HAZARDOUS PER 29CFR 1910-1200:

NAME (CAS)	CERCLA RQ	RCRA NO	SARA REPORTABLE	%
ORGANIC SOLVENT (8002-05-9)	NOT LISTED	NOT LISTED	NO	30
ACGIH TLV: NOT ESTABLISHED				
OSHA PEL: NOT ESTABLISHED				
DI-BUTYL PHTHALATE (84-74-2)	NOT LISTED	NOT LISTED	NO	<5
ACGIH TLV: 5 mg/m3				
OSHA PEL: 5 mg/m3				
VINYL CHLORIDE - VINYL ACETATE COPOLYMER (9003-22-9)	NOT LISTED	NOT LISTED	NO	15
ACGIH TLV: NOT ESTABLISHED				
OSHA PEL: NOT ESTABLISHED				
METHYL ISOBUTYL KETONE (108-10-1)	5000	U161	YES	<5
ACGIH TLV: 50 ppm				
OSHA PEL: 50 ppm				
2-BUTANONE (METHYL ETHYL KETONE) (78-93-3)	5000	U159	YES	45
ACGIH TLV: 200 ppm				
OSHA PEL: 200 ppm				

THIS MSDS COMPLIES WITH THE COMMUNITY RIGHT-TO-KNOW LAWS OF CERTAIN STATES, INCLUDING PENNSYLVANIA AND NEW JERSEY.

CARCINOGENS: NONE (AS DEFINED IN 29CFR 1910-1200, APPENDIX A(1)

DOT INFORMATION
PROPER SHIPPING NAME: COATING SOLUTION
HAZARD CLASS: Flammable liquid ID NUMBER: UN1139

****

SECTION III PHYSICAL PROPERTIES (TYPICAL)

.oiling point: Approx. 169 deg. F. Specific gravity: 0.84
Vapor pressure: Approx. 70mmHg Volatile, % by volume: Approx. 85%
SCAQMD VOC: 669 g/l.(calculated from nominal composition)
Vapor density: >1 (air=1) Evaporation rate: >1 (BuAc=1)
Solubility in water: Negligible pH: Not applicable
Appearance and odor:
Clear blue liquid, Ketone odor

****

SECTION IV - FIRE AND EXPLOSION HAZARDS:

FLASH POINT AND METHOD USEB? F. (Setaflash)
EXTINGUISHING MEDIA:
Foam, carbon dioxide, dry chemical
SPECIAL FIRE FIGHTING PROCEDURE AND PRECAUTIONS:
Use self-contained respiratory protection.
UNUSUAL FIRE AND EXPLOSION HAZARDS:
Vapors from this product are heavier than air and may travel along the ground to be ignited at a point remote from material handling area.

****

SECTION V - HEALTH AND EMERGENCY INFORMATION:

EFFECTS OF OVER-EXPOSURE: EYES:
Contact with eyes may cause moderate to severe irritation.
SKIN:
Contact with skin may cause moderate to severe irritation, drying, defatting, readily absorbed through skin in toxic amounts.
INHALATION:
Vapors: Moderate irritation, dizziness, headache, possible narcosis.
Mist: Severe respiratory irritation, nausea, possible lung damage.
INGESTION:
Moderate to severe irritation of gastrointestinal tract, nausea.
MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED:
Prolonged or repeated overexposure to aromatic hydrocarbons may cause kidney and liver damage. Repeated overexposure may aggravate any preexisting dysfunction of these systems. Overexposure may lead to central nervous system depression.

****

SECTION VA - FIRST AID INFORMATION:

FIRST AID: EYES:
Flush eyes with large volumes of water for at least 15 minutes. If irritation persists, obtain medical attention.
SKIN:
Speed is essential. Flush affected area with large volumes of water. Wash with soap and water. Rinse thoroughly. If irritation is evident or blistering occurs, obtain medical attention.
INHALATION:
Remove to fresh air. If breathing is difficult, administer oxygen. If breathing has stopped, apply artificial respiration. Obtain medical attention.

INGESTION:
Do not induce vomiting except on advice of competent medical personnel. If vomiting occurs spontaneously, keep head below hip level to reduce possibility of aspiration pneumonitis. If victim is conscious, dilute by giving large volumes of milk or water. Obtain immediate medical attention. Never attempt to induce vomiting or give anything by mouth to an unconscious person.
PRIMARY ROUTES OF ENTRY ARE INHALATION AND SKIN CONTACT.

****

SECTION VI - REACTIVITY DATA:

STABILITY: STABLE
CONDITIONS TO AVOID:
Contact with strong acids, strong alkalies, strong oxidizers
HAZARDOUS DECOMPOSITION PRODUCTS:
Thermal decomposition may produce carbon monoxide, dioxide and other toxic volatile organic compounds

****

SECTION VII - SPILL, LEAK AND DISPOSAL PROCEDURE:

SPILL OR RELEASE PROCEDURE: CONCENTRATE
Cleanup personnel should use appropriate protective equipment. Contain spillage. Stop leak at source if this can be done safely. Ventilate area. Eliminate all sources of vapor ignition. Nonessential personnel should leave the area until cleanup is completed. Pump liquid into DOT-approved drums for disposal. Absorb remaining liquid onto inert absorbent and place in DOT-approved drums for disposal. Wash area with water. Collect washings and place in DOT-approved drums for disposal. Keep concentrate and wash water from entering sewers or waterways.
USE SOLUTION:
As for concentrate, if applicable.
DISPOSAL INFORMATION: CONCENTRATE:
(1) Transfer to reclaiming center for recycling or reuse, if possible.
(2) Transfer to licensed hazardous waste treatment or disposal site for disposition under applicable local, state and regional regulations as hazardous waste.
SPENT SOLUTION AND RINSES:
If applicable, rinse water may be neutralized (if not already neutral) and allowed to stand. The separated solvent should be skimmed off and disposed as described above. The water may then be treated to remove residual organic material by oxidation and/or carbon treatment. The clarified water may be released to sewer if local regulations permit.

****

SECTION VIII - SPECIAL PROTECTION INFORMATION:

RESPIRATORY PROTECTION:
If TLV is exceeded, a NIOSH-approved self-contained breathing apparatus, positive pressure hose mask or an air line mask is advised. These should have a full face piece and be operated in a positive pressure mode. For limited exposure time, in areas of good ventilation, a full face mask with an organic vapor cartridge or canister may be used. These must not be used in any areas where a danger of oxygen deficiency exists, such as partly enclosed or low lying areas, including sumps or tanks. If respirators are used, a formal training and screening program must be initiated. See 29 CFR 1910-134.

VENTILATION:
Maintain sufficient mechanical ventilation to keep concentration below TLV.
PROTECTIVE EQUIPMENT:
Protective equipment: Face shield or goggles, gloves, boots and apron made of solvent resistant material (e.g. neoprene, viton, etc.). Protective suit not normally required.
RECOMMENDED PERSONAL HYGIENE
Wash hands and face with soap and water before smoking or eating. Immediately remove all contaminated clothing. Launder separately before reuse.

****

SECTION IX - OTHER INFORMATION:

SPECIAL PRECAUTIONS - STORAGE AND HANDLING:
Store in dry protected area away from strong oxidizing agents, strong acids and strong alkalies. Metal containers should be fitted with a bonded ground wire when material is transferred. Empty containers may contain flammable vapors in dangerous amounts.
MIXING:
Does not apply.
REPAIR AND MAINTENANCE OF CONTAMINATED EQUIPMENT:
Relieve any pressure. Cover openings to avoid spurting. Clean exterior and interior by flushing with water. Collect flushings for disposal. Use protective equipment for eyes, skin and inhalation.

****

CHECKED BY: Ron Dubs, Project Chemist
APPROVED BY: John F. Grainger, Director Tech. Serv.
DATE PREPARED: 01/09/92 DATE PRINTED: 07/13/92 FILE NO: 4497.010/0

TURCO Decon 4324

TURCO MATERIAL SAFETY DATA SHEET

TURCO DECON 4324

Date: 07/13/92

SECTION I MANUFACTURER'S NAME AND ADDRESS

Manufacturer's Name: TURCO PRODUCTS, INC.
DIVISION OF ATOCHEM NORTH AMERICA
Address: 7300 BOLSA AVENUE
WESTMINSTER, CA 92684
Emergency telephone: (614) 387-6200
For information: (714) 890-3600

SECTION II HAZARD INFORMATION

THE FOLLOWING INGREDIENTS ARE DEFINED TO BE HAZARDOUS PER 29CFR 1910-1200:

NAME (CAS)	CERCLA RQ	RCRA NO	SARA REPORTABLE	%
*AMMONIUM BICARBONATE (1066-33-7)	5000	NOT LISTED	NO	50
ACGIH TLV: NOT ESTABLISHED OSHA PEL: NOT ESTABLISHED				
OCTYLPHENOXYPOLY(ETHYLENEOXY)ETHANOL (9002-93-1)	NOT LISTED	NOT LISTED	NO	<5
ACGIH TLV: NOT ESTABLISHED OSHA PEL: NOT ESTABLISHED				
NONYLPHENOXYPOLY(ETHYLENEOXY)ETHANOL (9016-45-9)	NOT LISTED	NOT LISTED	NO	<5
ACGIH TLV: NOT ESTABLISHED OSHA PEL: NOT ESTABLISHED				

*THIS COMPONENT CONTAINS 21.5% AMMONIA(7664-41-7), WHICH, IF RELEASED, IS SARA REPORTABLE.

THE FOLLOWING INGREDIENTS ARE NOT REQUIRED TO BE LISTED BY 29CFR 1910-1200, BUT ARE LISTED IN CONFORMANCE WITH THE 'RIGHT-TO-KNOW' LAWS OF CERTAIN STATES, INCLUDING PENNSYLVANIA AND NEW JERSEY:

SODIUM HEXAMETAPHOSPHATE (10124-56-8),
SODIUM CARBOXYMETHYL CELLULOSE (9004-32-4)

CARCINOGENS: NONE (AS DEFINED IN 29CFR 1910-1200, APPENDIX A(1)

DOT INFORMATION
PROPER SHIPPING NAME: NOT REGULATED BY DOT IN NORMAL GROUND TRANSPORTATION IN CONTAINERS OF 110 GALLONS OR LESS

SECTION III PHYSICAL PROPERTIES (TYPICAL)

Boiling point: Not applicable
Vapor pressure: Not applicable
Vapor density: Not applicable (air=1)
Solubility in water: Appreciable
Specific gravity: Not applicable
Volatile: Not applicable
Evaporation rate: Not applicable (BuAc=1)
pH: 3% in solution 8.0
Appearance and odor:
White-free-flowing powder; ammonia odor

SECTION IV - FIRE AND EXPLOSION HAZARDS:

FLASH POINT AND METHOD USED:
Nonflammable - Not applicable

EXTINGUISHING MEDIA:
Not applicable
SPECIAL FIRE FIGHTING PROCEDURE AND PRECAUTIONS:
Use self-contained respiratory protection.
UNUSUAL FIRE AND EXPLOSION HAZARDS:
None

SECTION V - HEALTH AND EMERGENCY INFORMATION:

EFFECTS OF OVER-EXPOSURE: EYES:
Contact with eyes may cause moderate to severe irritation.
SKIN:
Contact with skin may cause moderate to severe irritation.
INHALATION:
Inhalation of product dust or mist from product solution may cause irritation of respiratory tract. Inhalation of large amounts may cause systemic effects. See ingestion.
INGESTION:
Moderate to severe irritation of gastrointestinal tract.
MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED:
No known chronic effects that differ from acute effects.

SECTION VA - FIRST AID INFORMATION:

FIRST AID: EYES:
Flush eyes with large volumes of water for at least 15 minutes. If irritation persists, obtain medical attention.
SKIN:
Flush affected area with large volumes of water. Continue flushing at least 15 minutes. If irritation is evident or blistering occurs, obtain medical attention.
INHALATION:
Remove to fresh air. Administer oxygen if breathing is difficult. Obtain medical attention if irritation persists.
INGESTION:
Do not induce vomiting except on advice of competent medical personnel. If victim is conscious, dilute by giving large volumes of milk or water. Obtain immediate medical attention. Never attempt to induce vomiting or give anything by mouth to an unconscious person.

PRIMARY ROUTES OF ENTRY ARE INHALATION AND SKIN CONTACT.

SECTION VI - REACTIVITY DATA:

STABILITY: STABLE
CONDITIONS TO AVOID:
Contact with strong acid, strong caustic, strong oxidizing agents
HAZARDOUS DECOMPOSITION PRODUCTS:
None

SECTION VII - SPILL, LEAK AND DISPOSAL PROCEDURE:

SPILL OR RELEASE PROCEDURE: CONCENTRATE
Cleanup personnel should use appropriate protective equipment. Shovel dry spill into DOT-approved drums for disposal. Keep spill dry until as much as possible has been swept up and shoveled into disposal drums. Residual amounts should be dissolved in water and solution collected in DOT-approved drums for disposal. Do not allow product or rinse water from spill to enter sewer or waterways.
USE SOLUTION:
Confine spill. Stop leak at source if this can be done safely. Ventilate area. Pump liquid into drums for disposal. Absorb remaining liquid onto inert absorbent and place in sealable containers for disposal. Wash area with water. Residual amounts may be flushed to sewer if local regulations permit.
DISPOSAL INFORMATION: CONCENTRATE:
(1) Transfer to reclaiming center for recycling or reuse, if possible.
(2) Transfer to licensed hazardous waste treatment or disposal site for disposition under applicable local, state and regional regulations as hazardous waste.
SPENT SOLUTION AND RINSES:
Dispose per (1) or (2) above, or spent solution and rinses can be neutralized and floatable soil separated. Any residual organic matters may be removed by oxidation and/or carbon treatment. Treat to remove phosphates if required. Clarified water may be released to sewer if local regulations permit.

SECTION VIII - SPECIAL PROTECTION INFORMATION:

RESPIRATORY PROTECTION:
For dust or mist conditions, a NIOSH-approved respirator for toxic dusts and mists is advised. If respirators are used, a formal training and screening program must be initiated. See 29 CFR 1910-134.
VENTILATION:
Maintain sufficient mechanical ventilation to keep vapor concentration below TLV.
PROTECTIVE EQUIPMENT:
Protective equipment: Face shield or goggles, gloves, boots and apron made of neoprene or other impervious material. Protective suit not normally required, but advised if necessary to avoid prolonged or repeated skin contact or other exposure.

RECOMMENDED PERSONAL HYGIENE
Wash hands and face with soap and water before smoking or eating. Immediately remove all contaminated clothing. Launder separately before reuse.

****

SECTION IX - OTHER INFORMATION:

SPECIAL PRECAUTIONS - STORAGE AND HANDLING:
Store in dry protected area.

MIXING:
Carefully add to water while mixing, taking care to avoid splashing. Use appropriate safety equipment to eliminate possibility of skin or eye contact. Make additions to in-use tanks slowly and cautiously.
REPAIR AND MAINTENANCE OF CONTAMINATED EQUIPMENT:
Relieve any pressure. Cover openings to avoid spurting. Clean exterior and interior by flushing with water. Collect flushings for disposal. Use protective equipment for eyes, skin and inhalation.

****

CHECKED BY: John Distaso, Research Manager
APPROVED BY: John F. Grainger, Director Tech. Serv.
DATE PREPARED: 11/12/91 DATE PRINTED: 07/13/92 FILE NO: 4324.023/0

TURCO Decon 4502

TURCO MATERIAL SAFETY DATA SHEET

TURCO DECON 4502 — CS No.: 01923

Date: 07/13/92 — Page 1 of 4

SECTION I MANUFACTURER'S NAME AND ADDRESS

Manufacturer's Name: TURCO PRODUCTS, INC.
DIVISION OF ATOCHEM NORTH AMERICA
Address: 7300 BOLSA AVENUE
WESTMINSTER, CA 92684
Emergency telephone: (614) 387-6200
For information: (714) 890-3600

SECTION II HAZARD INFORMATION

THE FOLLOWING INGREDIENTS ARE DEFINED TO BE HAZARDOUS PER 29CFR 1910-1200:

NAME (CAS)	CERCLA RQ	RCRA NO	SARA REPORTABLE	%
POTASSIUM HYDROXIDE (1310-58-3)	1000	NOT LISTED	NO	70
ACGIH TLV: C 2 mg/m3				
OSHA PEL: C 2 mg/m3				
POTASSIUM CHROMATE (7789-00-6)	10	NOT LISTED	NO	<5
ACGIH TLV: .05 mg(Cr)/m3				
OSHA PEL: C 0.10 mg/m3 (as CrO3)				
POTASSIUM PERMANGANATE (7722-64-7)	100	NOT LISTED	NO	20
ACGIH TLV: 5 mg/m3 Mn				
OSHA PEL: C 5 mg/m3 Mn				

THIS MSDS COMPLIES WITH THE COMMUNITY RIGHT-TO-KNOW LAWS OF CERTAIN STATES, INCLUDING PENNSYLVANIA AND NEW JERSEY.

THE FOLLOWING INGREDIENTS ARE LISTED IN COMPLIANCE WITH 29CFR 1910-1200,APPENDIX A(1):

HEXAVALENT CHROMIUM COMPOUNDS (as Cr): 0.8%
IARC: CARCINOGENIC TO HUMANS (GROUP 1)
NTP: KNOWN TO BE CARCINOGENIC (GROUP A)

DOT INFORMATION

PROPER SHIPPING NAME: RQ Corrosive solid, n.o.s.
(Potassium hydroxide, potassium permanganate)

HAZARD CLASS: Corrosive material — **ID NUMBER:** UN1759

SECTION III PHYSICAL PROPERTIES (TYPICAL)

oiling point: Not applicable
Vapor pressure: Not applicable
Vapor density: Not applicable (air=1)
Solubility in water: Appreciable
Appearance and odor:
Violet flakes, little or no odor

Specific gravity: Not applicable
Volatile: Not applicable
Evaporation rate: Not applicable (BuAc=1)
pH: 3.1% in water 13.0

SECTION IV - FIRE AND EXPLOSION HAZARDS:

FLASH POINT AND METHOD USED:
Nonflammable - Not applicable

EXTINGUISHING MEDIA:
Not applicable
SPECIAL FIRE FIGHTING PROCEDURE AND PRECAUTIONS:
Use self-contained respiratory protection. Any water runoff may contain hexavalent chrome and should not be allowed to enter sewer or waterways.
UNUSUAL FIRE AND EXPLOSION HAZARDS:
Contact with water and reactive metals, such as aluminum, zinc, tin, etc., may lead to generation of hydrogen gas in explosive amounts. Permanganate and chromate may increase intensity of fire by furnishing oxygen to fire.

SECTION V - HEALTH AND EMERGENCY INFORMATION:

EFFECTS OF OVER-EXPOSURE: EYES:
Contact of product, product dust or product solution with eyes may cause severe burns; possible permanent tissue damage and possible blindness.
SKIN:
Contact of product, product dust or product solution with skin may cause severe irritation, possible chemical burns and possible permanent tissue damage.
INHALATION:
Inhalation of chromate containing dust or mist may cause severe irritation and possible permanent damage to upper respiratory tract and may cause lung cancer risk.
INGESTION:
Severe irritation to gastrointestinal tract, possible tissue damage, may be harmful or fatal if swallowed. Toxic effects may not appear immediately.
MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED:
No known chronic effects that differ from acute effects.

SECTION VA - FIRST AID INFORMATION:

FIRST AID: EYES:
Speed is essential. Immediately begin flushing eyes with large volumes of water. Continue for 5 minutes. Follow with normal saline for 30-60 minutes. Hold lids apart to assure contact with all surfaces. Obtain immediate medical attention. (Send someone for medical assistance as soon as flushing is started.)

SKIN:
Speed is essential. Flush affected area with large volumes of water. Continue flushing until "slippery" feel is gone, but at least 15 minutes. If irritation is evident or blistering occurs, obtain medical attention.
INHALATION:
Remove to fresh air. Administer oxygen if breathing is difficult. Obtain medical attention if irritation persists.
INGESTION:
Do not induce vomiting except on advice of competent medical personnel. If victim is conscious, dilute by giving large volumes of milk or water. Obtain immediate medical attention. Never attempt to induce vomiting or give anything by mouth to an unconscious person.
PRIMARY ROUTES OF ENTRY ARE INHALATION AND SKIN CONTACT.

****

SECTION VI - REACTIVITY DATA:

STABILITY: STABLE
CONDITIONS TO AVOID:
Contact with strong acids, reactive metals, organic materials
HAZARDOUS DECOMPOSITION PRODUCTS:
None

****

SECTION VII - SPILL, LEAK AND DISPOSAL PROCEDURE:

SPILL OR RELEASE PROCEDURE: CONCENTRATE
Cleanup personnel should use appropriate protective equipment. Shovel dry spill into DOT-approved drums for disposal. Keep spill dry until as much as possible has been swept up and shoveled into disposal drums. Residual amounts should be dissolved in water and solution collected in DOT-approved drums for disposal. Do not allow product or rinse water from spill to enter sewer or waterways.
USE SOLUTION:
Confine spill. Stop leak at source if this can be done safely. Ventilate area. Nonessential personnel should leave the area until cleanup is completed. Pump liquid into DOT-approved drums for disposal. Absorb remaining liquid onto inert absorbent and place in DOT-approved drums for disposal. Wash area with water. Collect washings and place in DOT-approved drums. Keep spill and washings from entering sewer or waterways.
DISPOSAL INFORMATION: CONCENTRATE:
(1) Transfer to reclaiming center for recycling or reuse, if possible.
(2) Transfer to licensed hazardous waste treatment or disposal site for disposition under applicable local, state and regional regulations as hazardous waste.
SPENT SOLUTION AND RINSES:
Dispose per (1) or (2) above, or spent solution and rinses can be neutralized, floatable soil separated, and chromate and permanganate removed by reduction and precipitation. The pH of the separated water should then be readjusted to 7-8. The clarified water may be released to sewer if local regulations permit.

****

SECTION VIII - SPECIAL PROTECTION INFORMATION:

RESPIRATORY PROTECTION:
For dust or mist conditions, a NIOSH-approved respirator for toxic dusts and mists is advised. If respirators are used, a formal training and screening program must be initiated. See 29 CFR 1910-134.

VENTILATION:
Maintain sufficient mechanical ventilation to keep vapor concentration below TLV.

PROTECTIVE EQUIPMENT:
Protective equipment: Face shield or goggles, gloves, boots and apron made of alkali resistant material (e.g. neoprene, viton, etc.). Protective suit not normally required, but advised if necessary to avoid prolonged or repeated skin contact or other exposure.

RECOMMENDED PERSONAL HYGIENE
Wash hands and face with soap and water before smoking or eating. Immediately remove all contaminated clothing. Launder separately before reuse. Discard shoes that become contaminated on the interior.

****

SECTION IX - OTHER INFORMATION:

SPECIAL PRECAUTIONS - STORAGE AND HANDLING:
Store in dry protected area. CAUTION: Hazardous carbon monoxide gas can form upon contact with food and beverage products. This can collect in enclosed spaces and can be fatal. Follow appropriate tank entry procedures (see ANSI Z117.1-1977). Personnel entering such areas must be provided with respiratory protection and a safety line. They should be kept under observation while in the area by another man at a safe distance.

MIXING:
Use appropriate safety equipment to avoid skin and eye contact. Add slowly to tepid water while mixing. Never dump large amounts into water - violent steam eruption may occur. Add only as fast as product dissolves. Make additions to in-use tank slowly and cautiously, preferably pre-dissolved in water.

REPAIR AND MAINTENANCE OF CONTAMINATED EQUIPMENT:
Relieve any pressure. Cover openings to avoid spurting. Clean exterior and interior by flushing with water. Collect flushings for disposal. Use protective equipment for eyes, skin and inhalation.

****

CHECKED BY: John P. Jones, Research Manager
APPROVED BY: John F. Grainger, Director Tech. Serv.
DATE PREPARED: 09/13/90 DATE PRINTED: 07/13/92 FILE NO: 4502.012/0

TURCO Decon 4182-A

TURCO MATERIAL SAFETY DATA SHEET

TURCO DECON 4182-A

CS No.: 01910

Date: 07/13/92

SECTION I MANUFACTURER'S NAME AND ADDRESS

Manufacturer's Name: TURCO PRODUCTS, INC.
DIVISION OF ATOCHEM NORTH AMERICA
Address: 7300 BOLSA AVENUE
WESTMINSTER, CA 92684
Emergency telephone: (614) 387-6200
For information: (714) 890-3600

SECTION II HAZARD INFORMATION

THE FOLLOWING INGREDIENTS ARE DEFINED TO BE HAZARDOUS PER 29CFR 1910-1200:

NAME (CAS)	CERCLA RQ	RCRA NO	SARA REPORTABLE	%
NONYLPHENOXYPOLY(ETHYLENEOXY)ETHANOL (9016-45-9)	NOT LISTED	NOT LISTED	NO	<5
ACGIH TLV: NOT ESTABLISHED; OSHA PEL: NOT ESTABLISHED				
AMMONIUM BICARBONATE (1066-33-7)	NOT LISTED	NOT LISTED	NO	50
ACGIH TLV: NOT ESTABLISHED; OSHA PEL: NOT ESTABLISHED				
SODIUM DODECYLBENZENE SULFONATE (25155-30-0)	1000	NOT LISTED	NO	<5
ACGIH TLV: NOT ESTABLISHED; OSHA PEL: NOT ESTABLISHED				

THE FOLLOWING INGREDIENTS ARE NOT REQUIRED TO BE LISTED BY 29CFR 1910-1200, BUT ARE LISTED IN CONFORMANCE WITH THE 'RIGHT-TO-KNOW' LAWS OF CERTAIN STATES, INCLUDING PENNSYLVANIA AND NEW JERSEY:

SODIUM HEXAMETAPHOSPHATE (10124-56-8),
SODIUM CARBOXYMETHYLCELLULOSE (9004-32-4)

CARCINOGENS: NONE (AS DEFINED IN 29CFR 1910-1200, APPENDIX A(1)

DOT INFORMATION
PROPER SHIPPING NAME: NOT REGULATED BY DOT IN NORMAL GROUND TRANSPORTATION IN CONTAINERS OF 110 GALLONS OR LESS

SECTION III PHYSICAL PROPERTIES (TYPICAL)

Boiling point: Not applicable
Vapor pressure: Not applicable
Vapor density: Not applicable (air=1)
Solubility in water: Appreciable
Appearance and odor:
White free-flowing powder, ammonia odor

Specific gravity: Not applicable
Volatile: Not applicable
Evaporation rate: Not applicable (BuAc=1)
pH: 3% in solution 7.5

****

SECTION IV - FIRE AND EXPLOSION HAZARDS:

FLASH POINT AND METHOD USED:
Nonflammable - Not applicable

EXTINGUISHING MEDIA:
Not applicable
SPECIAL FIRE FIGHTING PROCEDURE AND PRECAUTIONS:
Use self-contained respiratory protection.
UNUSUAL FIRE AND EXPLOSION HAZARDS:
None

****

SECTION V - HEALTH AND EMERGENCY INFORMATION:

EFFECTS OF OVER-EXPOSURE: EYES:
Contact with eyes may cause moderate to severe irritation.
SKIN:
Contact with skin may cause moderate to severe irritation.
INHALATION:
Inhalation of product dust or mist from product solution may cause irritation of respiratory tract. Inhalation of large amounts may cause systemic effects. See ingestion.
INGESTION:
Moderate to severe irritation of gastrointestinal tract.
MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED:
No known chronic effects that differ from acute effects.

****

SECTION VA - FIRST AID INFORMATION:

FIRST AID: EYES:
Flush eyes with large volumes of water for at least 15 minutes. If irritation persists, obtain medical attention.
SKIN:
Flush affected area with large volumes of water. Continue flushing at least 15 minutes. If irritation is evident or blistering occurs, obtain medical attention.
INHALATION:
Remove to fresh air. Administer oxygen if breathing is difficult. Obtain medical attention if irritation persists.
INGESTION:
Do not induce vomiting except on advice of competent medical personnel. If victim is conscious, dilute by giving large volumes of milk or water. Obtain immediate medical attention. Never attempt to induce vomiting or give anything by mouth to an unconscious person.
PRIMARY ROUTES OF ENTRY ARE INHALATION AND SKIN CONTACT.

****

SECTION VI - REACTIVITY DATA:

STABILITY: STABLE
CONDITIONS TO AVOID:
Contact with strong acid, strong caustic, strong oxidizing agents

HAZARDOUS DECOMPOSITION PRODUCTS:
None

SECTION VII - SPILL, LEAK AND DISPOSAL PROCEDURE:

SPILL OR RELEASE PROCEDURE: CONCENTRATE
Cleanup personnel should use appropriate protective equipment. Shovel dry spill into DOT-approved drums for disposal. Keep spill dry until as much as possible has been swept up and shoveled into disposal drums. Residual amounts should be dissolved in water and solution collected in DOT-approved drums for disposal. Do not allow product or rinse water from spill to enter sewer or waterways.
USE SOLUTION:
Confine spill. Stop leak at source if this can be done safely. Ventilate area. Pump liquid into drums for disposal. Absorb remaining liquid onto inert absorbent and place in sealable containers for disposal. Wash area with water. Residual amounts may be flushed to sewer if local regulations permit.
DISPOSAL INFORMATION: CONCENTRATE:
(1) Transfer to reclaiming center for recycling or reuse, if possible.
(2) Transfer to licensed hazardous waste treatment or disposal site for disposition under applicable local, state and regional regulations as hazardous waste.
SPENT SOLUTION AND RINSES:
Dispose per (1) or (2) above, or spent solution and rinses can be neutralized and floatable soil separated. Any residual organic matters may be removed by oxidation and/or carbon treatment. Treat to remove phosphates if required. Clarified water may be released to sewer if local regulations permit.

SECTION VIII - SPECIAL PROTECTION INFORMATION:

RESPIRATORY PROTECTION:
For dust or mist conditions, a NIOSH-approved respirator for toxic dusts and mists is advised. If respirators are used, a formal training and screening program must be initiated. See 29 CFR 1910-134.
VENTILATION:
Maintain sufficient mechanical ventilation to keep vapor concentration below TLV.
PROTECTIVE EQUIPMENT:
Protective equipment: Face shield or goggles, gloves, boots and apron made of neoprene or other impervious material. Protective suit not normally required, but advised if necessary to avoid prolonged or repeated skin contact or other exposure.
RECOMMENDED PERSONAL HYGIENE
Wash hands and face with soap and water before smoking or eating. Immediately remove all contaminated clothing. Launder separately before reuse.

SECTION IX - OTHER INFORMATION:

SPECIAL PRECAUTIONS - STORAGE AND HANDLING:
Store in dry protected area.

MIXING:
Carefully add to water while mixing, taking care to avoid splashing. Use appropriate safety equipment to eliminate possibility of skin or eye contact. Make additions to in-use tanks slowly and cautiously.

REPAIR AND MAINTENANCE OF CONTAMINATED EQUIPMENT:
Relieve any pressure. Cover openings to avoid spurting. Clean exterior and interior by flushing with water. Collect flushings for disposal. Use protective equipment for eyes, skin and inhalation.

****

CHECKED BY: John P. Jones, Research Manager
APPROVED BY: John F. Grainger, Director Tech. Serv.
DATE PREPARED: 09/12/90 DATE PRINTED: 07/13/92 FILE NO: 4182.022/0

TURCO Decon Solvent

TURCO MATERIAL SAFETY DATA SHEET

TURCO DECON SOLVENT

CS No.: 01957

Date: 07/14/92

Page 1 of 4

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SECTION I MANUFACTURER'S NAME AND ADDRESS

Manufacturer's Name: TURCO PRODUCTS, INC.
DIVISION OF ATOCHEM NORTH AMERICA
Address: 7300 BOLSA AVENUE
WESTMINSTER, CA 92684
Emergency telephone: (614) 387-6200
For information: (714) 890-3600

****

SECTION II HAZARD INFORMATION

THE FOLLOWING INGREDIENTS ARE DEFINED TO BE HAZARDOUS PER 29CFR 1910-1200:

NAME (CAS)	CERCLA RQ	RCRA NO	SARA REPORTABLE	%
PETROLEUM NAPTHA (8002-05-9)	NOT LISTED	NOT LISTED	NO	50
ACGIH TLV: 100 ppm				
OSHA PEL: 400 ppm				
TRICHLOROETHYLENE (79-01-6)	100	U228	YES	35
ACGIH TLV: 50 ppm				
OSHA PEL: 50 ppm				
METHYLENE CHLORIDE (75-09-2)	1000	U080	YES	<5
ACGIH TLV: 50 ppm				
OSHA PEL: 500 ppm				
TRIBUTYL PHOSPHATE (126-73-8)	NOT LISTED	NOT LISTED	NO	10
ACGIH TLV: .2 ppm				
OSHA PEL: .2 ppm				

THE FOLLOWING INGREDIENTS ARE NOT REQUIRED TO BE LISTED BY 29CFR 1910-1200, BUT ARE LISTED IN CONFORMANCE WITH THE 'RIGHT-TO-KNOW' LAWS OF CERTAIN STATES, INCLUDING PENNSYLVANIA AND NEW JERSEY:

2-BUTOXYETHANOL (111-76-2)

THE FOLLOWING INGREDIENTS ARE LISTED IN COMPLIANCE WITH 29CFR 1910-1200,APPENDIX A(1):

DI(2-ETHYLHEXYL)PHTHALATE: 4.5%
IARC: POSSIBLY CARCINOGENIC TO HUMANS (GROUP 2B)
NTP: NOT LISTED

DOT INFORMATION
PROPER SHIPPING NAME: NOT REGULATED BY DOT IN NORMAL GROUND TRANSPORTATION IN CONTAINERS OF 110 GALLONS OR LESS

****

SECTION III PHYSICAL PROPERTIES (TYPICAL)

oiling point: Approx. 105 deg. F. Specific gravity: 0.98
Vapor pressure: Approx. 50mmHg Volatile, % by volume: Approx. 90%
SCAQMD VOC: Contains no volatile organic compounds. (0 g/l)
Vapor density: >1 (air=1) Evaporation rate: <1 (BuAc=1)
Solubility in water: Very slight pH: Not applicable
Appearance and odor:
Clear liquid, chlorinated solvent odor

****

SECTION IV - FIRE AND EXPLOSION HAZARDS:

FLASH POINT AND METHOD USED: 200 Fahrenheit.(TCC or Setaflash)
EXTINGUISHING MEDIA:
Carbon dioxide, foam, water fog

SPECIAL FIRE FIGHTING PROCEDURE AND PRECAUTIONS:
Use self-contained respiratory protection.
UNUSUAL FIRE AND EXPLOSION HAZARDS:
Thermal decomposition may produce toxic oxides of carbon and chlorine.
Drums exposed to 100F and above may develop sufficient internal pressure to rupture.

****

SECTION V - HEALTH AND EMERGENCY INFORMATION:

EFFECTS OF OVER-EXPOSURE: EYES:
Vapors: Contact with eyes may cause moderate to severe irritation.
Liquid: Contact with eyes may cause severe irritation.
SKIN:
Contact with skin may cause moderate to severe irritation, drying, defatting, readily absorbed through skin in toxic amounts.
INHALATION:
Dizziness, headache, intoxication. Overexposure may cause cancer risk.
INGESTION:
Moderate to severe irritation of gastrointestinal tract. May be harmful if swallowed. Toxic effects may not appear immediately.
MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED:
Metabolism of methylene chloride to carbon monoxide may lead to accumulation of dangerous levels of carboxyhemoglobin which may not be tolerated by persons with impaired cardio-pulmonary function. This may be aggravated by smoking.

****

SECTION VA - FIRST AID INFORMATION:

FIRST AID: EYES:
Immediately begin flushing eyes with large volumes of water. Continue for at least 15 minutes. Hold lids apart to assure contact with all surfaces. Obtain medical attention.
SKIN:
Flush affected area with large volumes of water. Continue flushing at least 15 minutes. If irritation is evident or blistering occurs, obtain medical attention.

INHALATION:
Remove to fresh air. If breathing is difficult, administer oxygen. If breathing has stopped, apply artificial respiration. Obtain medical attention.
INGESTION:
Do not induce vomiting except on advice of competent medical personnel. If victim is conscious, dilute by giving large volumes of milk or water. Obtain immediate medical attention. Never attempt to induce vomiting or give anything by mouth to an unconscious person.
PRIMARY ROUTES OF ENTRY ARE INHALATION AND SKIN CONTACT.

****

SECTION VI - REACTIVITY DATA:

STABILITY: STABLE
CONDITIONS TO AVOID:
Contact with strong acids, strong oxidizing agents, open flame
HAZARDOUS DECOMPOSITION PRODUCTS:
Hydrogen chloride, toxic compounds of carbon, chlorine and/or oxygen. Carbon monoxide, dioxide, other toxic volatile organic compounds.

****

SECTION VII - SPILL, LEAK AND DISPOSAL PROCEDURE:

SPILL OR RELEASE PROCEDURE: CONCENTRATE
Contain spillage. Stop leak at source if this can be done safely. Ventilate area. Nonessential personnel should leave the area until cleanup is completed. Pump liquid into DOT-approved drums for disposal. Absorb remaining liquid onto inert absorbent and place in DOT-approved drums for disposal. Wash area with water. Collect washings and place in DOT-approved drums for disposal. Keep concentrate and wash water from entering sewers or waterways.
USE SOLUTION:
Not applicable. This product is used as received.
DISPOSAL INFORMATION: CONCENTRATE:
(1) Transfer to reclaiming center for recycling or reuse, if possible.
(2) Transfer to licensed hazardous waste treatment or disposal site for disposition under applicable local, state and regional regulations as hazardous waste.
SPENT SOLUTION AND RINSES:
Not applicable. Product is used as is and evaporates as it is used.

****

SECTION VIII - SPECIAL PROTECTION INFORMATION:

RESPIRATORY PROTECTION:
If TLV is exceeded, a NIOSH-approved self-contained breathing apparatus, positive pressure hose mask or air line mask is advised. These should have a full face piece and be operated in positive pressure mode. Because of the short breakthrough time of methylene chloride and its poor warning properties, organic vapor cartridges or canisters are not recommended. If respirators are used, a formal training and screening program muust be initiatied. See 29 CFR 1910-134.
VENTILATION:
Maintain sufficient mechanical ventilation to keep concentration below TLV.

PROTECTIVE EQUIPMENT:
Protective equipment: Face shield or goggles, gloves, boots and apron made of solvent resistant material (e.g. neoprene, viton, etc.). Protective suit not normally required.
ECOMMENDED PERSONAL HYGIENE
Wash hands and face with soap and water before smoking or eating. Immediately remove all contaminated clothing. Launder separately before reuse. Discard shoes that become contaminated on the interior.

****

SECTION IX - OTHER INFORMATION:

SPECIAL PRECAUTIONS - STORAGE AND HANDLING:
Store in cool area protected from exposure to direct sunlight, rain or standing water. Use care in opening container to avoid spurting. CAUTION: Vapors from this product are heavier than air and will travel along the ground to collect in low lying areas, such as sumps. Personnel entering such areas must be provided with respiratory protection and a safety line. They should be kept under observation while in the area by another man at a safe distance. Persons wearing contact lenses should wear vapor-proof well-fitting goggles. NOTE: Do not use 1,1,1-trichloroethane, methylene chloride, perchloroethylene, or other halogenated solvents or solvent mixture containing halogenated solvents with pressurizable fluid handling equipment such as airless spray equipment containing aluminum or galvanized wetted parts. Direct contact between aluminum or galvanized metal and these or other chlorinated solvents could result in an uncontrollable chemical reaction and possible explosion.
MIXING:
Does not apply.
REPAIR AND MAINTENANCE OF CONTAMINATED EQUIPMENT:
Relieve any pressure. Cover openings to avoid spurting. Clean exterior and interior by flushing with water. Collect flushings for disposal. Use protective equipment for eyes, skin and inhalation.

****

CHECKED BY: John P. Jones, Research Manager
APPROVED BY: John F. Grainger, Director Tech. Serv.
DATE PREPARED: 07/13/92 DATE PRINTED: 07/14/92 FILE NO: 4358.005/0

TURCO 4518

TURCO MATERIAL SAFETY DATA SHEET

TURCO DECON 4518

Date: 03/31/94 CS No.: 01938

SECTION I MANUFACTURER'S NAME AND ADDRESS

Manufacturer's Name: TURCO PRODUCTS, INC.
DIVISION OF ELF ATOCHEM NORTH AMERICA
Address: 7320 BOLSA AVENUE
WESTMINSTER, CA 92684
Emergency telephone: (202) 483 7616 (800-424-9300)
For information: (714) 890-3600

SECTION II HAZARD INFORMATION

THE FOLLOWING INGREDIENTS ARE DEFINED TO BE HAZARDOUS PER 29CFR 1910-1200:

NAME (CAS)	CERCLA RQ	RCRA NO	SARA REPORTABLE	%
OXALIC ACID (144-62-7)	NOT LISTED	NOT LISTED	NO	90
ACGIH TLV: 1 mg/m3 OSHA PEL: 1 mg/m3				
CITRIC ACID (77-92-9)	NOT LISTED	NOT LISTED	NO	5
ACGIH TLV: NOT ESTABLISHED OSHA PEL: NOT ESTABLISHED				

THE FOLLOWING INGREDIENTS ARE NOT REQUIRED TO BE LISTED BY 29CFR 1910-1200, BUT ARE LISTED IN CONFORMANCE WITH THE 'RIGHT-TO-KNOW' LAWS OF CERTAIN STATES, INCLUDING PENNSYLVANIA AND NEW JERSEY:

TARTARIC ACID (87-69-4), 2 MERCAPTOBENZOTHIAZOLE (149-30-4), SODIUM DODECYLBENZENE SULFONATE (25155-30-0)

CARCINOGENS: NONE (AS DEFINED IN 29CFR 1910-1200, APPENDIX A(1)

DOT INFORMATION
PROPER SHIPPING NAME: NOT REGULATED BY DOT IN NORMAL GROUND TRANSPORTATION IN CONTAINERS OF 110 GALLONS OR LESS

SECTION III PHYSICAL PROPERTIES (TYPICAL)

Boiling point: Not applicable
Vapor pressure: Not applicable
Vapor density: Not applicable (air=1)
Solubility in water: Soluble
Appearance and odor:
Light yellow granular mix. Odorless

Specific gravity: Not applicable
Volatile: Not applicable
Evaporation rate: Not applicable (BuAc=1)
pH: Not Applicable

SECTION IV - FIRE AND EXPLOSION HAZARDS:

FLASH POINT AND METHOD USED:
Nonflammable - Not applicable

EXTINGUISHING MEDIA:
Not applicable
SPECIAL FIRE FIGHTING PROCEDURE AND PRECAUTIONS:
Use self-contained respiratory protection.
UNUSUAL FIRE AND EXPLOSION HAZARDS:
Contact with water and reactive metals, such as magnesium, etc., may lead to generation of hydrogen gas in explosive amounts. Exposure to elevated temperatures, under fire conditions may lead to generation of toxic and corrosive vapors of bromine.

SECTION V - HEALTH AND EMERGENCY INFORMATION:

EFFECTS OF OVER-EXPOSURE: EYES:
Contact of product, product dust or product solution with eyes may cause chemical burns; possible permanent damage.
SKIN:
Contact of product, product dust or product solution with skin may cause severe irritation, possible chemical burns and possible permanent tissue damage.
INHALATION:
Inhalation of dust or mist may cause severe irritation and possible permanent damage to upper respiratory tract.
INGESTION:
Severe irritation to gastrointestinal tract, possible tissue damage, may be harmful or fatal if swallowed. Toxic effects may not appear immediately.
MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED:
Prolonged overexposure to fumes from hot oxalic acid solution may lead to renal impairment, aggravating any preexisting kidney dysfunction. No other known chronic effects that differ from acute effects.

SECTION VA - FIRST AID INFORMATION:

FIRST AID: EYES:
Speed is essential. Immediately begin flushing eyes with large volumes of water. Continue for 5 minutes. Follow with normal saline for 30-60 minutes. Hold lids apart to assure contact with all surfaces. Obtain immediate medical attention. (Send someone for medical assistance as soon as flushing is started.)
SKIN:
Flush affected area with large volumes of water. Continue flushing at least 15 minutes. If irritation is evident or blistering occurs, obtain medical attention.
INHALATION:
Remove to fresh air. Administer oxygen if breathing is difficult. Obtain medical attention if irritation persists.

INGESTION:
Do not induce vomiting except on advice of competent medical personnel. If victim is conscious dilute by giving large volumes of soluble calcium in any form, such as milk, calcium gluconate solution, or calcium lactate solution. Obtain immediate medical attention. Never attempt to induce vomiting or give anything by mouth to an unconscious person.
PRIMARY ROUTES OF ENTRY ARE INHALATION AND SKIN CONTACT.

****

SECTION VI - REACTIVITY DATA:

STABILITY: STABLE
CONDITIONS TO AVOID:
Contact with strong alkalies, reactive metals, organic materials
HAZARDOUS DECOMPOSITION PRODUCTS:
Thermal decomposition may produce carbon monoxide, dioxide and other toxic volatile organic compounds

****

SECTION VII - SPILL, LEAK AND DISPOSAL PROCEDURE:

SPILL OR RELEASE PROCEDURE: CONCENTRATE
Cleanup personnel should use appropriate protective equipment. Shovel dry spill into DOT-approved drums for disposal. Keep spill dry until as much as possible has been swept up and shoveled into disposal drums. Residual amounts should be dissolved in water and solution collected in DOT-approved drums for disposal. Area may be neutralized with soda ash solution. Neutralized washings may be treated as described below and released to sewer if local regulations permit.
USE SOLUTION:
Confine spill. Stop leak at source if this can be done safely. Ventilate area. Nonessential personnel should leave the area until cleanup is completed. Pump liquid into DOT-approved drums for disposal. Absorb remaining liquid onto inert absorbent and place in DOT-approved drums for disposal. Wash area with water and neutralize with soda ash solution. Collect washings and place in DOT-approved drums. Collected washings may be treated as described below or, if local regulations permit, washings containing only residual amounts of product may be released to sewer.
DISPOSAL INFORMATION: CONCENTRATE:
(1) Transfer to reclaiming center for recycling or reuse, if possible. (2) Transfer to licensed hazardous waste treatment or disposal site for disposition under applicable local, state and regional regulations as hazardous waste. (3) Small amounts may be dissolved in water and treated as described below. The clarified water may be released to sewer if local regulations permit.
SPENT SOLUTION AND RINSES:
Dispose per (1) or (2) above, or spent solution and rinses can be neutralized and floatable soil separated. Any residual organic matter may be removed by oxidation and/or carbon treatment. Clarified water may be released to sewer if local regulations permit.

****

SECTION VIII - SPECIAL PROTECTION INFORMATION:

RESPIRATORY PROTECTION:
For dust or mist conditions, a NIOSH-approved respirator for toxic dusts and mists is advised. If respirators are used, a formal training and screening program must be initiated. See 29 CFR 1910-134.

VENTILATION:
Maintain sufficient mechanical ventilation to keep vapor concentration below TLV.

PROTECTIVE EQUIPMENT:
Protective equipment: Face shield or goggles, gloves, boots and apron made of acid resistant material (e.g. viton, PVC, etc.). Protective suit not normally required, but advised if necessary to avoid any possible skin contact or other exposure.

RECOMMENDED PERSONAL HYGIENE
Wash hands and face with soap and water before smoking or eating. Immediately remove all contaminated clothing. Launder separately before reuse. Discard shoes that become contaminated on the interior.

****

SECTION IX - OTHER INFORMATION:

SPECIAL PRECAUTIONS - STORAGE AND HANDLING:
Store in dry protected area.

MIXING:
Use appropriate safety equipment to avoid skin and eye contact. Add slowly to tepid water while mixing. Never dump large amounts into water - violent steam eruption may occur. Add only as fast as product dissolves. Make additions to in-use tank slowly and cautiously, preferably pre-dissolved in water.

REPAIR AND MAINTENANCE OF CONTAMINATED EQUIPMENT:
Relieve any pressure. Cover openings to avoid spurting. Clean exterior and interior by flushing with water. Collect flushings for disposal. Use protective equipment for eyes, skin and inhalation.

****

CHECKED BY: John P. Jones, Research Manager
APPROVED BY: John F. Grainger, Director Tech. Serv.
DATE PREPARED: 08/27/90 DATE PRINTED: 03/31/94 FILE NO: 4518.007/0

TURCO 4521

TURCO MATERIAL SAFETY DATA SHEET

TURCO DECON 4521

Date: 03/31/94

CS No.: 0191:
Page 1 of 4

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SECTION I MANUFACTURER'S NAME AND ADDRESS

Manufacturer's Name: TURCO PRODUCTS, INC.
DIVISION OF ELF ATOCHEM NORTH AMERICA
Address: 7320 BOLSA AVENUE
WESTMINSTER, CA 92684
Emergency telephone: (202) 483 7616 (800-424-9300)
For information: (714) 890-3600

****

SECTION II HAZARD INFORMATION

THE FOLLOWING INGREDIENTS ARE DEFINED TO BE HAZARDOUS PER 29CFR 1910-1200:

NAME (CAS)	CERCLA RQ	RCRA NO	SARA REPORTABLE	%
OXALIC ACID (144-62-7)	NOT LISTED	NOT LISTED	NO	15
ACGIH TLV: 1 mg/m3				
OSHA PEL: 1 mg/m3				
AMMONIUM OXALATE (1113-38-8)	NOT LISTED	NOT LISTED	NO	80
ACGIH TLV: NOT ESTABLISHED				
OSHA PEL: NOT ESTABLISHED				
SILICA, AMORPHOUS (7631-86-9)	NOT LISTED	NOT LISTED	NO	<5
ACGIH TLV: 10 mg/m3 (total dust)				
OSHA PEL: 6 mg/m3				

THE FOLLOWING INGREDIENTS ARE NOT REQUIRED TO BE LISTED BY 29CFR 1910-1200, BUT ARE LISTED IN CONFORMANCE WITH THE 'RIGHT-TO-KNOW' LAWS OF CERTAIN STATES, INCLUDING PENNSYLVANIA AND NEW JERSEY:

CITRIC ACID (77-92-9), 2 MERCAPTOBENZOTHIAZOLE (149-30-4)

CARCINOGENS: NONE (AS DEFINED IN 29CFR 1910-1200, APPENDIX A(1)

DOT INFORMATION
PROPER SHIPPING NAME: NOT REGULATED BY DOT IN NORMAL GROUND TRANSPORTATION IN CONTAINERS OF 110 GALLONS OR LESS

****

SECTION III PHYSICAL PROPERTIES (TYPICAL)

Boiling point: Not applicable
Vapor pressure: Not applicable
Vapor density: Not applicable (air=1)
Solubility in water: Appreciable
Appearance and odor:
White, odorless granules

Specific gravity: Not applicable
Volatile: Not applicable
Evaporation rate: Not applicable (BuAc=1)
pH: 6% in solution 3.8

****

SECTION IV - FIRE AND EXPLOSION HAZARDS:

FLASH POINT AND METHOD USED:
Nonflammable - Not applicable

EXTINGUISHING MEDIA:
Not applicable
SPECIAL FIRE FIGHTING PROCEDURE AND PRECAUTIONS:
Use self-contained respiratory protection.
UNUSUAL FIRE AND EXPLOSION HAZARDS:
None

****

SECTION V - HEALTH AND EMERGENCY INFORMATION:

EFFECTS OF OVER-EXPOSURE: EYES:
Contact with eyes may cause moderate to severe irritation.
SKIN:
Contact with skin may cause moderate to severe irritation.
INHALATION:
Inhalation of product dust or mist from product solution may cause irritation of respiratory tract. Inhalation of large amounts may cause systemic effects. See ingestion.
INGESTION:
Moderate to severe irritation of gastrointestinal tract.
MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED:
No known chronic effects that differ from acute effects.

****

SECTION VA - FIRST AID INFORMATION:

FIRST AID: EYES:
Flush eyes with large volumes of water for at least 15 minutes. If irritation persists, obtain medical attention.
SKIN:
Flush affected area with large volumes of water. Continue flushing at least 15 minutes. If irritation is evident or blistering occurs, obtain medical attention.
INHALATION:
Remove to fresh air. Administer oxygen if breathing is difficult. Obtain medical attention if irritation persists.
INGESTION:
Do not induce vomiting except on advice of competent medical personnel. If victim is conscious, dilute by giving large volumes of milk or water. Obtain immediate medical attention. Never attempt to induce vomiting or give anything by mouth to an unconscious person.
PRIMARY ROUTES OF ENTRY ARE INHALATION AND SKIN CONTACT.

****

SECTION VI - REACTIVITY DATA:

STABILITY: STABLE
CONDITIONS TO AVOID:
Contact with strong acid, strong caustic, strong oxidizing agents

HAZARDOUS DECOMPOSITION PRODUCTS:
None

***

SECTION VII - SPILL, LEAK AND DISPOSAL PROCEDURE:

SPILL OR RELEASE PROCEDURE: CONCENTRATE
Cleanup personnel should use appropriate protective equipment. Shovel dry spill into DOT-approved drums for disposal. Keep spill dry until as much as possible has been swept up and shoveled into disposal drums. Residual amounts should be dissolved in water and solution collected in DOT-approved drums for disposal. Do not allow product or rinse water from spill to enter sewer or waterways.
USE SOLUTION:
Confine spill. Stop leak at source if this can be done safely. Ventilate area. Pump liquid into drums for disposal. Absorb remaining liquid onto inert absorbent and place in sealable containers for disposal. Wash area with water. Residual amounts may be flushed to sewer if local regulations permit.
DISPOSAL INFORMATION: CONCENTRATE:
(1) Transfer to reclaiming center for recycling or reuse, if possible.
(2) Transfer to licensed waste treatment or disposal site for disposition under applicable local, state and regional regulations.
SPENT SOLUTION AND RINSES:
Dispose per (1) or (2) above, or spent solution and rinses can be neutralized and floatable soil separated. Any residual organic matters may be removed by oxidation and/or carbon treatment. Treat to remove phosphates if required. Clarified water may be released to sewer if local regulations permit.

***

SECTION VIII - SPECIAL PROTECTION INFORMATION:

RESPIRATORY PROTECTION:
For dust or mist conditions, a NIOSH-approved respirator for toxic dusts and mists is advised. If respirators are used, a formal training and screening program must be initiated. See 29 CFR 1910-134.
VENTILATION:
Maintain sufficient mechanical ventilation to keep vapor concentration below TLV.
PROTECTIVE EQUIPMENT:
Protective equipment: Face shield or goggles, gloves, boots and apron made of neoprene or other impervious material. Protective suit not normally required, but advised if necessary to avoid prolonged or repeated skin contact or other exposure.
RECOMMENDED PERSONAL HYGIENE
Wash hands and face with soap and water before smoking or eating. Immediately remove all contaminated clothing. Launder separately before reuse.

***

SECTION IX - OTHER INFORMATION:

SPECIAL PRECAUTIONS - STORAGE AND HANDLING:
Store in dry protected area.

MIXING:
Carefully add to water while mixing, taking care to avoid splashing. Use appropriate safety equipment to eliminate possibility of skin or eye contact. Make additions to in-use tanks slowly and cautiously.
REPAIR AND MAINTENANCE OF CONTAMINATED EQUIPMENT:
Relieve any pressure. Cover openings to avoid spurting. Clean exterior and interior by flushing with water. Collect flushings for disposal. Use protective equipment for eyes, skin and inhalation.

****

CHECKED BY: John P. Jones, Research Manager
APPROVED BY: John F. Grainger, Director Tech. Serv.
DATE PREPARED: 09/12/90 DATE PRINTED: 03/31/94 FILE NO: 4521.040/0

TURCO De-Scaler

TURCO MATERIAL SAFETY DATA SHEET

TURCO DE-SCALER

Date: 03/31/94

CS No.: 00955

SECTION I MANUFACTURER'S NAME AND ADDRESS

Manufacturer's Name: TURCO PRODUCTS, INC.
DIVISION OF ELF ATOCHEM NORTH AMERICA
Address: 7320 BOLSA AVENUE
WESTMINSTER, CA 92684
Emergency telephone: (202) 483 7616 (800-424-9300)
For information: (714) 890-3600

SECTION II HAZARD INFORMATION

THE FOLLOWING INGREDIENTS ARE DEFINED TO BE HAZARDOUS PER 29CFR 1910-1200:

NAME (CAS)	CERCLA RQ	RCRA NO	SARA REPORTABLE	%
HYDROCHLORIC ACID SOLUTION (7647-01-0)	5000	NOT LISTED	NO	>95

ACGIH TLV: C 5 ppm
OSHA PEL: C 5 ppm

THE FOLLOWING INGREDIENTS ARE NOT REQUIRED TO BE LISTED BY 29CFR 1910-1200, BUT ARE LISTED IN CONFORMANCE WITH THE 'RIGHT-TO-KNOW' LAWS OF CERTAIN STATES, INCLUDING PENNSYLVANIA AND NEW JERSEY:

WATER (7732-18-5),
NONYLPHENOXYPOLY(ETHYLENEOXY)ETHANOL (9016-45-9),
ETHOXYLATED DEHYDROABIETYLAMINE POLYRAD 0515 (51344-62-8),
2-BUTOXYETHANOL (111-76-2)

CARCINOGENS: NONE (AS DEFINED IN 29CFR 1910-1200, APPENDIX A(1)

DOT INFORMATION
PROPER SHIPPING NAME: Hydrochloric acid solution, inhibited
HAZARD CLASS: Corrosive material ID NUMBER: UN1789

SECTION III PHYSICAL PROPERTIES (TYPICAL)

Boiling point: Approx. 212 deg. F.
Vapor pressure: Approx. 25mmHg
Vapor density: >1 (air=1)
Solubility in water: Complete
Appearance and odor:
Clear, yellow liquid; pungent odor

Specific gravity: 1.16
Volatile, % by volume: Approx. 99
Evaporation rate: <1 (BuAc=1)
pH: Concentrated 1.0

****

SECTION IV - FIRE AND EXPLOSION HAZARDS:

FLASH POINT AND METHOD USED:
Nonflammable - Not applicable

EXTINGUISHING MEDIA:
Not applicable
SPECIAL FIRE FIGHTING PROCEDURE AND PRECAUTIONS:
Use self-contained respiratory protection.
UNUSUAL FIRE AND EXPLOSION HAZARDS:
Contact with reactive metals, such as aluminum, magnesium, etc., may lead to generation of hydrogen gas in explosive amounts.

****

SECTION V - HEALTH AND EMERGENCY INFORMATION:

EFFECTS OF OVER-EXPOSURE: EYES:
Contact of product, product solution or mist from these with eyes may cause severe irritation, possible chemical burns, possible severe tissue damage or destruction, possible blindness.
SKIN:
(Liquid, mist or vapor) Contact with skin may cause severe irritation, possible chemical burns, possible tissue damage.
INHALATION:
(Liquid, mist or vapor) Severe irritation, may cause damage to upper respiratory tract.
INGESTION:
Severe irritation, possible damage to gastrointestinal tract.
MEDICAL CONDITIONS WHICH MAY BE AGGRAVATED:
No known chronic effects that differ from acute effects.

****

SECTION VA - FIRST AID INFORMATION:

FIRST AID: EYES:
Speed is essential. Immediately begin flushing eyes with large volumes of water. Continue for 5 minutes. Follow with normal saline for 30-60 minutes. Hold lids apart to assure contact with all surfaces. Obtain immediate medical attention. (Send someone for medical assistance as soon as flushing is started.)
SKIN:
Speed is essential. Flush affected area with large volumes of water. Wash with soap and water. Rinse thoroughly. If irritation is evident or blistering occurs, obtain medical attention.
INHALATION:
Remove to fresh air. Administer oxygen if breathing is difficult. Obtain medical attention if irritation persists.
INGESTION:
Do not induce vomiting except on advice of competent medical personnel. If victim is conscious, dilute by giving large volumes of milk or water. Obtain immediate medical attention. Never attempt to induce vomiting or give anything by mouth to an unconscious person.

PRIMARY ROUTES OF ENTRY ARE INHALATION AND SKIN CONTACT.

SECTION VI - REACTIVITY DATA:

STABILITY: STABLE
CONDITIONS TO AVOID:
Contact with strong alkalies, reactive metals
HAZARDOUS DECOMPOSITION PRODUCTS:
Thermal decomposition may cause evolution of toxic and corrosive fumes of hydrogen chloride and/or toxic compounds of carbon and chlorine.

SECTION VII - SPILL, LEAK AND DISPOSAL PROCEDURE:

SPILL OR RELEASE PROCEDURE: CONCENTRATE
Confine spill. Stop leak at source if this can be done safely. Ventilate area. Nonessential personnel should leave the area until cleanup is completed. Pump liquid into DOT-approved drums for disposal. Absorb remaining liquid onto inert absorbent and place in DOT-approved drums for disposal. Wash area with water and neutralize with soda ash. Collect washings and place in DOT-approved drums. Collected washings may be treated as described below and released to sewer if local regulations permit.
USE SOLUTION:
As for concentrate, if applicable.
DISPOSAL INFORMATION: CONCENTRATE:
(1) Transfer to reclaiming center for recycling or reuse, if possible. (2) Transfer to licensed hazardous waste treatment or disposal site for disposition under applicable local, state and regional regulations as hazardous waste. (3) Small amounts may be dissolved in water and treated as described below. The clarified water may be released to sewer if local regulations permit.
SPENT SOLUTION AND RINSES:
Dispose per (1) or (2) above, or heavy metals (if present) may be precipitated by pH adjustment to 9.5 - 10.5; the pH of the separated water should then be readjusted to pH 7.0 - 8.0. The clarified water may be released to sewer if local regulations permit.

SECTION VIII - SPECIAL PROTECTION INFORMATION:

RESPIRATORY PROTECTION:
For mist conditions, a NIOSH-approved respirator for acid gases and mists is advised. If respirators are used, a formal training and screening program must be initiated. See 29 CFR 1910-134.
VENTILATION:
Maintain sufficient mechanical ventilation to keep vapor concentration below TLV.
PROTECTIVE EQUIPMENT:
Protective equipment: Face shield or goggles, gloves, boots and apron made of acid resistant material (e.g. viton, PVC, etc.). Protective suit not normally required, but advised if necessary to avoid any possible skin contact or other exposure.

TURCO DE-SCALER PAGE 4 OF 4

RECOMMENDED PERSONAL HYGIENE
Wash hands and face with soap and water before smoking or eating. Immediately remove all contaminated clothing. Launder separately before reuse. Discard shoes that become contaminated on the interior.

****

SECTION IX - OTHER INFORMATION:

SPECIAL PRECAUTIONS - STORAGE AND HANDLING:
Store in dry protected area. Open drums carefully to avoid spurting.
MIXING:
Carefully add to water while mixing, taking care to avoid splashing. Use appropriate safety equipment to eliminate possibility of skin or eye contact. Make additions to in-use tanks slowly and cautiously.
REPAIR AND MAINTENANCE OF CONTAMINATED EQUIPMENT:
Relieve any pressure. Cover openings to avoid spurting. Clean exterior and interior by flushing with water. Collect flushings for disposal. Use protective equipment for eyes, skin and inhalation.

****

CHECKED BY: John Distaso, Research Manager
APPROVED BY: John F. Grainger, Director Tech. Serv.
DATE PREPARED: 08/30/90 DATE PRINTED: 03/31/94 FILE NO: 3944.005/0

Alconox

Material Safety Data Sheet D-3224
May be used to comply with OSHA's Hazard Communication Standard, 29 CFR 1910.1200. Standard must be consulted for specific requirements.

U.S. Department of Labor
Occupational Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY (As Used on Label and List)	Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.
ALCONOX	

Section I

Manufacturer's Name: ALCONOX, INC.	Emergency Telephone Number: (212) 473-1300
Address (Number, Street, City, State, and ZIP Code): 215 PARK AVENUE SOUTH	Telephone Number for Information: (212) 473-1300
NEW YORK, N.Y. 10003	Date Prepared: JULY 1, 1987
	Signature of Preparer (optional)

Section II — Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	OSHA PEL	ACGIH TLV	Other Limits Recommended	% (optional)
THERE ARE NO INGREDIENTS IN ALCONOX WHICH APPEARED ON THE OSHA STANDARD 29 CFR 1910 SUBPART Z.				

Section III — Physical/Chemical Characteristics

Boiling Point	N.A.	Specific Gravity (H_2O = 1)	N.A.
Vapor Pressure (mm Hg.)	N.A.	Melting Point	N.A.
Vapor Density (AIR = 1)	N.A.	Evaporation Rate (Butyl Acetate = 1)	N.A.

Solubility in Water: APPRECIABLE (GREATER THAN 10 PER CENT)

Appearance and Odor: WHITE POWDER INTERSPERED WITH CREAM COLORED FLAKES - ODORLESS

Section IV — Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammable Limits	LEL	UEL
NONE		N.A.	N.A.

Extinguishing Media: WATER, CO_2, DRY CHEMICAL, FOAM, SAND/EARTH

Special Fire Fighting Procedures: FOR FIRES INVOLVING THIS MATERIAL DO NOT ENTER WITHOUT PROTECTIVE EQUIPMENT AND SELF CONTAINED BREATHING APPARATUS.

Unusual Fire and Explosion Hazards: NONE

(Reproduce locally) OSHA 174, Sept. 1985

Section V — Reactivity Data

Stability	Unstable		Conditions to Avoid NONE
	Stable	XX	

Incompatibility (*Materials to Avoid*) AVOID STRONG ACIDS

Hazardous Decomposition or Byproducts MAY RELEASE CO_2 GAS ON BURNING

Hazardous Polymerization	May Occur		Conditions to Avoid NONE
	Will Not Occur	XX	

Section VI — Health Hazard Data

Route(s) of Entry: Inhalation? YES Skin? NO Ingestion? YES

Health Hazards (*Acute and Chronic*) INHALATION OF POWDER MAY PROVE LOCALLY IRRITATING TO MUCOUS MEMBRANES. INGESTION MAY CAUSE DISCOMFORT AND/OR DIARRHEA.

Carcinogenicity: NTP? NO IARC Monographs? NO OSHA Regulated? NO

Signs and Symptoms of Exposure EXPOSURE MAY IRRITATE MUCOUS MEMBRANES. MAY CAUSE SNEEZING.

Medical Conditions Generally Aggravated by Exposure RESPIRATORY CONDITIONS MAY BE AGGRAVATED BY POWDER

Emergency and First Aid Procedures
EYES-FLUSH WITH PLENTY OF WATER FOR 15 MINUTES SKIN-FLUSH WITH PLENTY OF WATE[illegible]
INGESTION-DRINK LARGE QUANTITIES OF WATER, GET MEDICAL ATTENTION FOR DISCOMFORT

Section VII — Precautions for Safe Handling and Use

Steps to Be Taken in Case Material Is Released or Spilled MATERIAL FOAMS PROFUSELY. SHOVEL AND RECOVER AS MUCH AS POSSIBLE. RINSE REMAINDER TO SEWER. MATERIAL IS COMPLETELY BIODEGRADABLE.

Waste Disposal Method SMALL QUANTITIES MAY BE DISPOSED OF IN SEWER. LARGE QUANTITIES SHOULD BE DISPOSED OF ACCORDING TO LOCAL REQUIREMENTS FOR NON-HAZARDOUS DETERGENT.

Precautions to Be Taken in Handling and Storing STORE IN A DRY AREA TO PREVENT CAKING.

Other Precautions NO SPECIAL REQUIREMENTS OTHER THAN THE GOOD INDUSTRIAL HYGIENE AND SAFETY PRACTICES EMPLOYED WITH ANY INDUSTRIAL CHEMICAL.

Section VIII — Control Measures

Respiratory Protection (*Specify Type*) DUST MASK

Ventilation	Local Exhaust NORMAL	Special N.A.
	Mechanical (*General*) N.A.	Other N.A.

Protective Gloves USEFUL-NOT REQUIRED	Eye Protection USEFUL-NOT REQUIRED

Other Protective Clothing or Equipment NOT REQUIRED

Work/Hygienic Practices NO SPECIAL PRACTICES REQUIRED

• USGPO 1986-491-529/45775